RAILROAD GAZETTE

QUARTO VOL. XXIV.—NO. 21. A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS. THIRTY-SEVENTH YEAR.

NEW YORK: Published at 73 Broadway. FRIDAY, MAY 20, 1892. Entered at the Post Office at New York, N. Y., as Mail Matter of the Second Class. $4.20 per Year to U.S. and Canada. 6.08 " " Foreign Countries.

Brown Brothers & Co.,
PHILA. NEW YORK. BOSTON.
ALEX. BROWN & SONS, BALTIMORE
CONNECTED BY PRIVATE WIRES.
Members N. Y., Phila. and Baltimore Stock Exch's.
We buy and sell all first-class Investment Securities for customers. We receive accounts of Banks, Bankers, Corporations, Firms, and Individuals, on favorable terms, and make collection of drafts drawn abroad on all points in the United States and Canada, and of drafts drawn in the United States on foreign countries.
Investment Securities.
Letters of Credit. We also buy and sell Bills of Exchange on, and make cable transfers to all points. Also make collections and issue Commercial and Travelers' Credits available in all parts of the world.
BROWN, SHIPLEY & CO., LONDON.

BOOKS Molesworth's Pocket Book, $2. Spon's Engineer's Tables, 40c Catalogues free. E. & F.N. SPON & CO., 12 Cortlandt St., N. Y.

THE
BETHLEHEM IRON COMPANY,
80 Broadway, New York.
STEEL RAILS.
F. G. GORHAM, Sales Agent.
PRINCIPAL OFFICE AND WORKS:
SOUTH BETHLEHEM, PA.

WILSON BROTHERS & CO.,
Civil Engineers and Architects,
DREXEL BUILDING, PHILADELPHIA, PA.
Surveys made for Railway Lines.
Plans and Specifications Furnished for Buildings, Bridges, Water Works, Sewerage Systems, Harbor Improvements and all classes of Engineering and Architectural Work.
Construction of Work Attended To.
Examinations made of Railway, Mining and Other Properties

R. MUSHET'S
"SPECIAL" AND "TITANIC"
STEELS.
Sole Representatives in the United States,
B. M. JONES & CO.
Nos. 11 & 13 Oliver St., BOSTON.
No. 143 Liberty St., NEW YORK.

THE UNION SWITCH & SIGNAL CO.
GEO. WESTINGHOUSE, Jr., President.
E. H. Goodman, Vice-Pres. and Gen. Man. | Jas. Johnson, Sec'y and Treas.
J. G. Schreuder, Chief Engineer. | Geo. H. Paine, Gen'l Agt.
General Office and Works: SWISSVALE, Allegheny County, Penna., U. S. A.
Designers and Manfrs. of **Interlocking and Block Signal Appliances, Frogs, Slips, Switches, Switch Stands,** Etc. Sole manufacturers of the **Westinghouse Pat. Pneumatic Interlocking** and **Automatic Block Signals** Systems; Electric Automatic Track Circuit Block Signals; Electric Locking; Sykes System: Electric Crossing Alarm Bells; Saxby & Farmer Improved Interlocking; Special Appliances for protection of Draw Bridges, etc., etc. Plans and Estimates Furnished on Application
BOSTON OFFICE: Hathaway Building. | NEW YORK OFFICE: Times Building. | CHICAGO OFFICE: Home Insurance Building.

THE ROBERT W. HUNT & CO.
BUREAU OF **INSPECTION, TESTS AND CONSULTATION**
NOS. 631 and 633 THE ROOKERY, CHICAGO, ILL.
BRANCH OFFICES:
HAMILTON BUILDING, PITTSBURGH, PA. NO. 80 BROADWAY, NEW YORK.
328 CHESTNUT STREET, PHILADELPHIA.
ROBERT W. HUNT, M. Am. Soc. C. E., M. Am. Inst. M. E., M. Am. Soc. M. E., Late Gen. Supt. Troy Steel & Iron Co.
JOHN J. CONE, Engineer of Tests. G. W. G. FERRIS, C. E.
A. W. FIERO, Inspecting Engineer. JAMES C. HALLSTED, C. E.
Inspection of Rails, Fish Plates, Cars and other Railway Material. Chemical and Physical Laboratories. Analyses of Ores, Irons, Steels and Oils. Consultation on Iron and Steel Metallurgy and Construction. Northwestern Agents for Riehle Bros.' Testing Machines.

REGINALD CANNING & CO.
RAILWAY EQUIPMENT,
115 BROADWAY, NEW YORK.
We have in stock, and for sale for Cash or on Car Trust Plan, Locomotives, Passenger Combination and Freight Cars of every description.
TEN OPEN EXCURS ON CARS, Standard Gauge.—A SPECIAL BARGAIN.

ST. LOUIS.
BLACKMER & POST,
MANUFACTURERS OF
SUPERIOR VITRIFIED SALT-GLAZED
STANDARD SEWER PIPE
—AND—
Double Strength Culvert Pipe,
IN TWO AND ONE-HALF FOOT SECTIONS with IMPROVED SOCKETS
—FOR—
RAILROAD CULVERTS & WATER WORKS CONDUITS
WRITE FOR PAMPHLET, "SOMETHING ABOUT CULVERT PIPE."
BLACKMER & POST,
ST. LOUIS.
Branch Office: Germania Building, St. Paul, Minn.

PENNSYLVANIA STEEL CO.,
STEEL RAILS.
New York Office, 2 Wall Street.
STEPHEN W. BALDWIN, Agent.
CHAS. S. CLARK, 70 Kilby St., Boston, Mass.

G. D. PETERS & CO.,
Moorgate Works, Moorfields, London, Eng.,
MANUFACTURERS OF
RAILWAY SUPPLIES.
New inventions introduced and the sale and manufacture of specialties undertaken.

OLIVER OWNER OLIVER ADAMS AGENT U.S. LEASED TO **ADAMS**
32 Liberty St., N. Y. P. O. Box 1364, NEW YORK.
CAR promptly negotiated for large and small amounts. TRUSTS

GEO. A. EVANS,
18 WALL STREET, NEW YORK.
STEEL RAILS,
LOCOMOTIVES,
Passenger and Freight Cars.
Railway Fastenings, Frogs and Switches.

ED. N. KIRK TALCOTT
Civil and Mechanical Engineer,
57 BROADWAY, NEW YORK,
Will advise MANUFACTURERS as to desirable locations for particular lines, and inspect and procure plants for TOWNS WANTING MANUFACTURES.

Bradford L. Gilbert
ARCHITECT,
TOWER BLDG., 50 Broadway, N. Y. City.
Specialty: Railroad Stations.

TURNBUCKLES
Cleveland City Forge & Iron Co.,
CLEVELAND O.
New York Office, 136 Liberty St.

SIGNALING Interlocking Switch and Signal Apparatus. Semaphore Block and Station Signals. Frogs and Crossings. Switches and Switch Stands. **INTERLOCKING**
ALLENTOWN ROLLING MILLS,
Switch and Signal Dept., FRED'K S. GUERBER, M'g'r. Office and Works, ALLENTOWN, PA.

JAMES IRVINE, President. GEO. B. F. COOPER, Vice-President.
NEW YORK EQUIPMENT COMPANY
15 WALL STREET, NEW YORK,
Have For Sale, for Cash or Lease on Easy Terms on the Car-Trust Plan,
LOCOMOTIVES, PASSENGER AND FREIGHT CARS, ETC.,
Of both Standard and Narrow Gauge, to Railroad Companies, Logging Railroads, Mining Companies, Contractors, etc.
WE HAVE READY FOR IMMEDIATE DELIVERY, IN PERFECT ORDER,
Six standard-gauge locomotives, and a large number of 20 and 25-ton coal and flat cars.

CHAS. R. JOHNSON, Pres't. and Gen. Man. HENRY JOHNSON, Mgr. of Works and Treas. D. W. PHELAN, Secretary. H. M. SPERRY, Gen. Agent.
THE JOHNSON RAILROAD SIGNAL CO.,
Designers and Manufacturers of
Railroad Signaling Appliances,
INTERLOCKING and BLOCK SIGNALS.
Plans and bids submitted for interlocking Grade Crossings, Junctions, Yards, Terminals, Passing Stations, etc.
DISTANT SWITCH SIGNALS.
ELECTRIC REPEATERS.
TORPEDO ATTACHMENTS.
Works and Main Office, RAHWAY, N. J. New York Office, 47 BROADWAY.

LOCOMOTIVE POP VALVES
THE ASHTON VALVES THE MOST EFFICIENT VALVES MADE.
THE ASHTON VALVE CO., 271 Franklin St., - BOSTON; 218 Lake St., - CHICAGO; 107 Liberty St., - NEW YORK
CRANES OF ALL TYPES
Particulars on Application.
THE YALE & TOWNE MFG CO., Stamford Conn.
NEW YORK. CHICAGO. PHILADELPHIA. BOSTON.

ALBERT LUCIUS,
CIVIL AND MECHANICAL ENGINEER, 71 Broadway, N. Y. All kinds of Engineering Structures, Plans, Specifications, Estimates, Superintendence, Bridge Inspection & Reports.

George P. Whittlesey, Railroad Inventions a specialty. **PATENTS.**
Late Examiner U. S. Patent Off.
Atlantic Building. WASHINGTON, D. C., U. S. A.

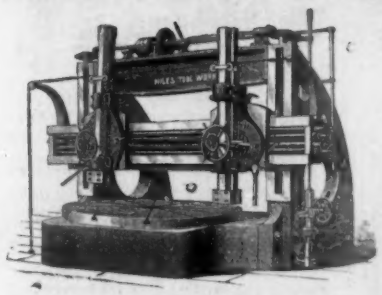
PITTSBURGH TESTING LABORATORY.
HUNT & CLAPP, 116 Water St., Pittsburgh, Pa.
METALLURGICAL ENGINEERS AND CHEMISTS.
Specialties.- Inspection of rails and of material for bridges and other structures. Chemical analyses and physical tests of all kinds. Agency for Tinius Olsen & Co.'s testing machines and Thacher's Slide Rule. Slide rules kept constantly in stock. Price, $30.00.

A. S. WHITON, No. 115 Broadway, NEW YORK.
STEEL RAILS. Old Rails and Railway Supplies. Contracts made for delivery in U. S., West Indies, South America or F. O. B. English Ports.

WM. BARCLAY PARSONS,
M. AM. SOC. C. E.,
CIVIL ENGINEER.
22 William Street, New York.

F. W. DEVOE & CO.'S COLORS AND VARNISHES ARE STANDARDS

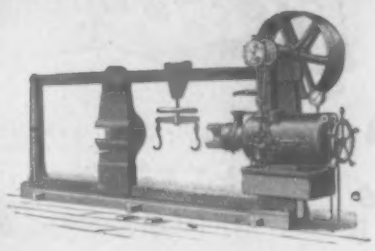
NILES TOOL WORKS, HAMILTON, O.

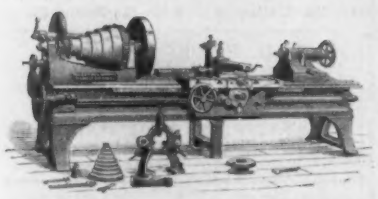


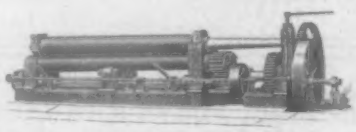
MACHINE TOOLS.

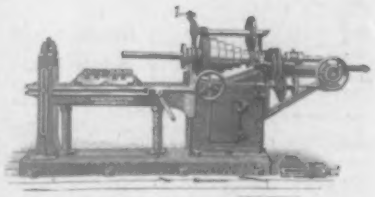
RAILROAD, CAR, LOCOMOTIVE AND MACHINE SHOPS FURNISHED WITH COMPLETE EQUIPMENT.

Driving wheel Lathes,
Screw-cutting Engine Lathes,
Single and Double Axle Lathes,
Hydrostatic Wheel Presses,
Planers,
Special Switch and Frog Planers,
Shaping Machines,
Boring and Turning Mills,
Horizontal Boring and Drilling Machines,
Vertical Drills,
Multiple Drills,
Arch-bar Drills,
Pulley Machines,
Car-wheel Lathes,
Heavy Forge Lathes,
Car-wheel Boring Machines,
Screw Machines,
Plate Planers,
Slotting Machines,
Cylinder Boring Machines,
Universal Radial Drills,
Car-wheel Drills,
Rail Drills,
Power-bending Rolls,
Plate-straightening Machines
Etc., etc.









CHICAGO, Phenix Bldg.
PITTSBURGH, Lewis Block.
NEW YORK, 136 & 138 Liberty St.

No. 121 "ACME" CHANDELIER, With Electric Fixtures.

THE ADAMS & WESTLAKE CO.,

MANUFACTURERS OF

Car Lamps, Lanterns, Headlights, Signals, Switch and Train Tail Lights, etc.,

ALSO A COMPLETE LINE OF

Interior Car Trimmings,
Switch Locks,
Car Seats, etc., etc.

THE ADAMS & WESTLAKE CO.,
CHICAGO, ILL.

NEW, REVISED, ENLARGED EDITION
—OF—

THE TRAIN WIRE,

A DISCUSSION OF THE SCIENCE OF TRAIN DISPATCHING.

BY

J. A. ANDERSON, OF THE PENNSYLVANIA RAILROAD.

WITH AN INTRODUCTION BY

B. B. ADAMS, Jr., of the RAILROAD GAZETTE.

152 pages (5 x 7½ in.). Price $1.25.

The first eight chapters are discussions of the general principles, and treat of: **Train Dispatching. The Dispatcher, The Operator, The Order** (with photographic illustrations of very good and very bad manuscripts), **The Manifold, The Record, The Train-Order Signal, The Transmission.**

Chapter Nine contains the standard code of rules for the movement of trains by telegraphic orders, with comments on each rule, giving valuable practical advice as to its application in special cases, and making its purpose and necessity clear.

Chapter Ten contains the standard forms of train orders, and the remaining chapters treat of rules as to rights of track, numbering switches, etc.

The book is complete and exhaustive as a practical handbook and course of instruction for an inexperienced operator, and there are few superintendents or dispatchers who may not learn much from Mr. Anderson's long experience in this department. He is probably the best authority in the world on train dispatching.

PUBLISHED AND FOR SALE BY

The RAILROAD GAZETTE, 71 Broadway, New York.

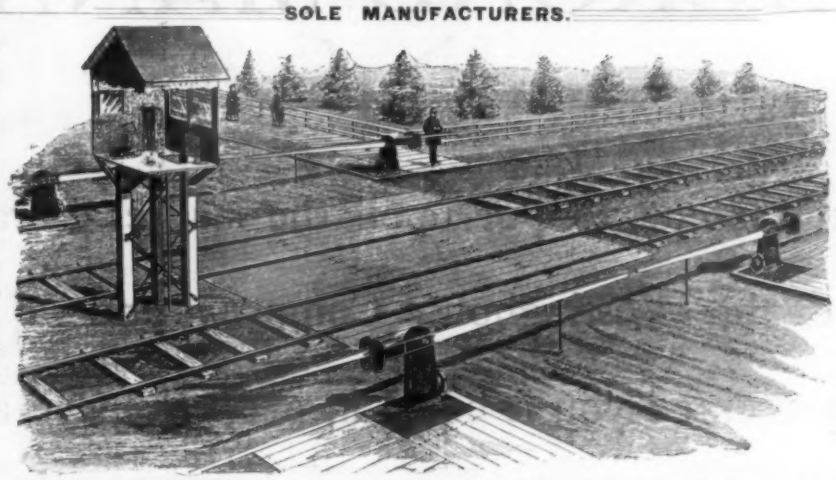
GEORGE M. BOGUE, President. M. B. MILLS, Vice-President O. A. BOGUE, Sec'y and Treas.

BOGUE & MILLS MANUFACTURING COMPANY,

SOLE MANUFACTURERS.

Of the Roads Extensively Using Our Gates, We Refer you to the

Chicago & Northwestern; Chicago, Burlington & Quincy; Chicago & Western Indiana; Chicago, Rock Island & Pacific; Chicago & Grand Trunk; Illinois Central; Chicago & West Michigan; Chicago, St. Louis & Pittsburgh; Chicago & Alton; Chicago & Eastern Illinois; Long Island.



Correspondence Solicited.

Delaware & Hudson Canal Co.; Pittsburgh, Cincinnati, Chicago & St. Louis; St. Louis & San Francisco; Louisville, New Orleans & Texas; Evansville & Terre Haute; Pittsburgh & Lake Erie; Pittsburgh, Fort Wayne & Chicago; Toledo & Ohio Central; Baltimore & Ohio; Union Pacific System; Denver & Rio Grande.

MILLS SYSTEM OF AIR, LEVER AND CABLE GATES FOR RAILROAD CROSSINGS.

The Mills' Air or Pneumatic Gate is less complicated in its construction than any crossing gate made, therefore less liable to get out of order.

The Mills' is the only Air or Pneumatic Gate made that locks its arms down as well as up and that operates its arms together. This is a very essential point to consider, as we can show where accidents have occurred when one arm had come down into position and the other but partly down, thus allowing teams to pass through and under the arm on to the tracks.

OFFICE: 218 LA SALLE STREET, CHICAGO, ILL.

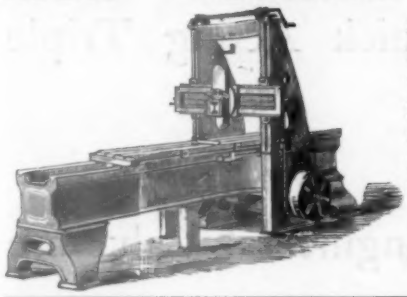
Established 1867.

EDWIN HARRINGTON, SON & COMPANY.

Works and Office: Cor. N. 15th St. & Penn Ave., Philadelphia, Pa., U.S.A.

MANUFACTURERS OF A FULL LINE OF

IRON WORKING MACHINERY



Including Extension and Gap Lathes, Planers with Quick Return, Drills, etc., Hand Power Elevators with Patent Brake, Double Chain Screw Hoists, Overhead Tramway with Switch, Turntable and Geared Truck.

SEND FOR ESTIMATES.

GEAR CUTTING A SPECIALTY.

WIRE ROPE

FOR ALL PURPOSES.

IRON AND STEEL WIRE OF ALL KINDS

TRENTON IRON CO.

TRENTON, N.J.

NEW YORK OFFICE COOPER HEWITT & Co. 17 BURLING SLIP

WIRE ROPE TRAMWAYS &c

R. CARMAN COMBES, President. THOS. J. SWIFT, Managing Director. J. W. LATTIG, Gen'l Supt. and Treas. H. S. PFEIL, Gen'l Agt. and Sig. Engr.

NATIONAL SWITCH & SIGNAL COMPANY

Office and Works: EASTON, PENNA.

—DESIGNERS AND MANUFACTURERS OF—

RAILROAD SAFETY APPLIANCES.

Mechanical and Electrical Interlocking, Electric Block Signals and Distant Switch Signals.

PLANS MADE AND BIDS SUBMITTED FOR INTERLOCKING TERMINALS, YARDS, JUNCTIONS, GRADE CROSSINGS, DRAW-BRIDGES, PASSING STATIONS, etc.

SPECIAL APPLIANCES:

Koyls' Parabolic Illuminated Semaphore,
National Torpedo Machine,
M. & S. Double-Wire Compensator,
National Selector,
Adjustable Clamp Pipe Lug.

New York Office: 41 Pine St. Southern Agent: J. A. CHISHOLM, Savannah, Ga.

WESTERN UNION TELEGRAPH OFFICE AT THE WORKS.

TO RAILROAD MANAGERS

We do not intend to put upon the market a brake in any way inferior to that of the Westinghouse Company, and we assert that our system as now presented you is equal in every respect, and superior in some, to that of the Westinghouse now on the market.

We also assert that our Quick Action No. 2 Triple Valves are operated by the Westinghouse Pump, and the Westinghouse Engineers' Valve equally as well as the Westinghouse Quick Acting Triple Valves.

We also assert that our Duplex Pump and Engineers' Valve are decidedly better than the Westinghouse Pump and Engineers' Valve, and will operate either the Westinghouse or the New York Car Brakes to better advantage than the Westinghouse engine equipment.

Competition has not only improved the quality, but reduced the price, and we think, in view of the above facts, that we are entitled to a share of your patronage.

THE NEW YORK AIR BRAKE CO.,

115 BROADWAY, NEW YORK CITY.

ROYAL C. VILAS, President.

CHAS. A. STARBUCK, Vice-President.

JOHN C. THOMPSON, Secretary and Treasurer.

ALBERT P. MASSEY, Mechanical Engineer.

ACCIDENTS FROM TRACK SPREADING PREVENTED.

THE SHOULDER TIE PLATE

1. Prevents Widening of the Gauge. 2. Prolongs the Life of the Tie.
3. Prevents Cutting at Neck of the Spike.

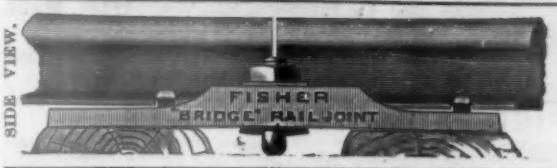
The rail bearing against the shoulder brings into use the inside as well as the outside of spike, doubles the present resistance to lateral thrust and thus effectually prevents spreading of the track.
Especially adapted for use in Yards, at Terminals, and on Curves and Bridges.
THE SHOULDER TIE PLATE is in use on thirteen railroads. Among others, the Norfolk Southern, Central of New Jersey, Louisville & Nashville, Pittsburgh & Western, Long Island, White Electric, etc., etc.

THE SHOULDER TIE-PLATE COMPANY,

GENERAL OFFICE: J. T. STEWART, Sec. and Treas., 1511-1515 N. 31st St., PHILADELPHIA.
BRANCH OFFICES: { SIGOURNEY F. CLARK, 18 Front St., NEW YORK.
C. I. WICKERSHAM, The Rookery, CHICAGO, ILL.

Send for Circulars and Samples for Trial.

SIDE VIEW.



Rail Ends carried directly by the arched beam and screwed DOWN to it with a force of 15,000 lbs.—making practically a continuous rail. Whole surface of base for support and wear. No breakage of Rails or Joints. No "low joints." No "creeping." No loose nuts. Cost of keeping up track reduced to one-third of that with Angle Bars and giving smoother surface.

ALL OF WROUGHT IRON AND STEEL.

For further information address

FISHER RAIL JOINT WORKS, Trenton, N. J. ½ of Full Size.

RENSSELAER POLYTECHNIC INSTITUTE, TROY, N. Y.

A SCHOOL OF ENGINEERING. Established 1824. Send for a Catalogue to the Director.

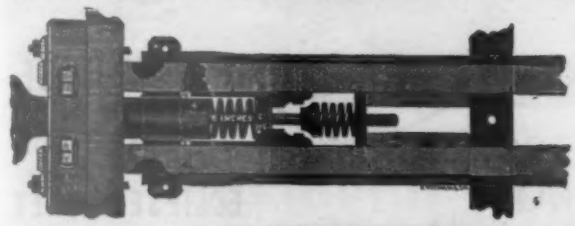
ALPHABETICAL INDEX TO ADVERTISEMENTS.

(Classified Index on the next page.)

Abendroth & Root Mfg. Co.
Acme Machy. Co. 6
Adams, Oliver 1
Adams & Westlake Co. 2
Ajax Metal Co. 34
Allen Paper Car Wheel Co.
Allentown Rolling Mills 1
Allison Mfg. Co 26
American Car Door Co. 2
Amer. Cent. Draw bar Co. 5
American Fluoride Co. 6
Amer. Steel Scraper Co. 16
American Steel Wheel Co. 30
American Washer & Mfg. Co. 7
Anderson & Barr 37
Andrews Paint & Color Co. 31
Appleton, Thomas 18
Ashcroft Mfg. Co. 34
Ashton Valve Co. 1
Austin, F. C., Mfg. Co. 25
Auto-Interch. Car Coup. Co. 27
Baker, Wm. C. 15
Baldwin Loco. Wks. 35
Baltimore Car Wheel Co. 34
B. & O. R. R. 15
Barkly & House 11
Barnes, D. L. 12
Barnum & Richardson Mfg. Co. 32
Bement, Mills & Co. 8
Berlin Iron Bridge Co. 36
Berry & Orton Co. 6
Bethlehem Iron Co. 1
Billings & Spencer Co. 7
Blackmer & Post 1
Bliss, E. W., Co. 8
Bloomsburg Car Co. 26
Bogue & Mills Mfg. Co. 3
Boston Bridge Works 26
Boston Wrinser Co. 12
Boston & Albany R. R. 30
Bouscaren, G. 18
Bowler & Co 30
Boyden Brake Co. 14
Bradley, Osgood & Son. 37
Brightly, C. E. 13
Brill, J. G. & Co. 26
Brooks Loco. Wks 35
Brown Bros. & Co. 1
Brown Hoist. & Conv. Mach. Co. 16
Brown & Sharpe Mfg. Co 22
Bryant & Barbey, Boston 6
Buckeye Auto. Car Coup. Co. 29
Bucyrus Stm Shovel & Dredge Co 17
Buda Foundry & Mfg. Co. 3
Buffalo Seal & Press Co. 25
Burkhardt's, Geo. J. Sons
Bush Cattle Guard Co 1
Butler Drawbar Attach. Co.
Cabell, L. Breckinridge 18
Cambria Iron Co. 16
Canda Mfg. Co. 26
Canning, R. & Co. 1
Cayuta Wheel & F'dry Co. 31
Chester Steel Castings Co. 43
Chicago Bridge & Iron Co. 37
C., B. & Q. R. R. 33
C. C. C. & St. L. Ry. 33
C., H. & D. Ry. 33
C., M. & St. P. Ry. 33
C., R. I. & P. Ry 12
Chicago & Alton R. R. 33
Chicago & N. W. Ry. 3
Cleveland City Forge & Iron Co. 1
Cleveland Frog & Cross. Co.
Congdon Brake Shoe Co. 37
Connelly, J. T. 38
Consolidated Car Heating Co. 35
Cont. Rail Joint Co. of Amer. 31
Cooke Loco. & Mach. Co. 35
Copeland & Bacon
Creosote Lum. & Const. Co. 30
Croes, J. J. B. 13
Curtis Regulator Co. 15
Cushion Car Wheel Co. 30
Davenport & Fairbain 31
Dayton Mfg. Co 16
De LaVergne Ref. Mach. Co. 16
Delaware Car Works 26
Detroit Bridge & Iron Wks 38
Detroit Lubricator Co. 31
De Voe, F. W., & Co. 1
Dickson Car Wheel Co.
Dickson Mfg. Co. 27
Dilworth, Porter & Co 4
Dixon Crucible Co., Jos. 11
Drake & Weirs. 16
Drexel Ry. Supply Co 27
Dudgeon, Richard 9
East. Gran. Roof Co. 16
Eckstein, C. G. & Co 30
Edge Moor Bridge Works. 37
Egan Co., The 9
Electric Secret Service Co. 14
Electric Supply & Mfg. Co. 16
Elliott Frog & Switch Co. 29
Elmira Bridge Co. 36
Employment 13
Engin Employm. Bureau 3
"Engineering News" 12-13
Eno Rail Joint Co 31
Ensign Mfg. Co. 26
Erie Car Works 36
Eureka Cast Steel Co.
Evans, Geo A 1
Fairbank-, Morse & Co. 10
Falls Hollow Stay Bolt Co. 34
Farist Steel Co. 18
Fay, J. A. & Co. 8
Ferracute Machine Co. 9
Field Water Purifier Co. 10
Fisher Rail Joint Works. 5
Fishkill Landing Mach. Co. 15
Fitchburg R. R. 33
Flagg, Stanley G. & Co. 7
Flood & Conklin. 13
Fontaine Crossing 32
Foos Mfg. Co.
Fowler, Geo. L. 13
French Spring Co., A. 18
Prescolt, S. W 36
Fuller Bros. & Co. 34
Gardner, O. K. 15
Gates Iron Wks. 9
Gilbert, Bradford L. 1
Gill-Alexander El. Mfg. Co. 21
Gold Car Heating Co. 24
Goodwin, J. B. 5
Gould Coupler Co. 28
Gould & Eberhardt
Gounds Mfg. Co 31
Grand Union Hotel. 12
Greenlee Bros. & Co. 9
Guarantee Co., N. A.
Hale & Kilburn Mfg. Co. 27
Hall Signal Co. 19-20
Halsey, as. T. 31
Hammett, M. C. 34
Harrington, Edw., Son & Co. 2
Hartford Steam Boiler I. & I. Co. 17
Hartford Woven Wire Mattress Co. 16
Harvey Steel Car Co. 26
Hayes Tool Co. 12
Heller & Brightly 19
Hendricks Bros. 35
Hildreth, R. W. & Co. 16
Hinckley Brake Co. 11
Hinson Car Coupler Co. 27
Hinson Draw Bar Attach 16
Hocsac Tunnel Route 31
Hopkins & Weirs. 16
Howard Iron Wks. 31
Howson & Howson.
Hunt, C. W. Co. 33
Hunt, Robt. W. & Co., The. 2
Hutchins, C. B., & Sons 40
Illinois Central R. R. 33
Illinois Steel Co. 14
Industrial Works. 17
Ingersoll-Sargent Drill Co. 17
Jackson & Sharp Co. 27
Jackson & Woodin Mfg. Co. 27
Jersey City Wheel Fdy. & M. Co. 3
Johns, H. W., Mfg. Co. 22
Johnson Railroad Signal Co 1
Johnston Car Coupling Co. 29
Johnston R. R., Fr. & S. Co. 26
Jones, S. M., & Co. 1
Jul Mfg. Co. 35
Kalamazoo R. R. Velocipede & Car Co. 11
Kelsey Railroad Signal Co. 2
Ketcham, C. F., & Co. 5
Keuffel & Esser Co. 12
Keystone Bridge Co. 37
King Bridge Co. 36
Kinsman Block System Co. 21
Knitted Mattress Co. 40
Laidlaw & Dunn Co. 31
L. S. & M. S. R. R. 33
Latrobe Steel Works. 3
Lee Composite Mfg. Co.
Lehigh Val. Creosot'g Wks. 12
Lehigh Valley R. R.
Lidgerwood Mfg. Co.
Lima Machine Works. 34
Link Belt Engineering Co.
Link Belt Machy. Co 11
Lodbell Car Wheel Co. 31
Long & Allstatter Co. 8
Louisv. Bridge & Iron Wks. 36
Louisv. Car Wh'l Ry. Sup. Co.
Louisville Steam Forge Co 40
Lucius, Albert 1
Lukens Iron & Steel Co. 18
Males, A. S. & Co. 13
Manning, Maxwell & Moore 8
Marion Steam Shovel Co 17
Martin Anti-Fire Car Heat. Co. 25
Mason Regulator Co 22
McClure, Alex. 38
McCoy Co., Jos. F
McConway & Torley Co. 29
McGill Iron Works Co. 28
McSherry Mfg. Co. 9
Meneely Bearing Co. 34
Metcalf, Paul & Co 18
Michigan Central Ry 33
Michigan Forge & Iron Co. 18
Middleton, W. S 13
Middletown Car Works 27
Kidvale Steel Co 30
Missouri Pacific Ry 33
Mo. Vy. Bridge & Iron Wks 36
Moran Flexible Steam Joint Co. 4
Morse Twist Drill & Mach. Co. 6
Morton Safety Heating. 25
Mt. Vernon Bridge Co. 40
Mosier Safety Signal Co. 21
Mundy, J. S 11
Murphy Varnish Co. 22
Nathan Mfg. Co. 40
Natl. Electric Headlight Co.
Natl. Hollow Brake Beam Co. 40
National Lock Washer Co. 24
Natl. Malleable Castings Co. 14
National Paint Works 38
National Switch & Signal Co. 3
Newark Mach. Tool Wks. 40
New Jersey St. & Ir. Co. 35
N. Y. Air Brake Co. 4
N. Y. Belting & Packing Co., Ltd. 16
N. Y. Car Wheel Wks. 40
N. Y. C. & R. R. R. R. 33
N. Y. Equipment Co. 1
N. Y., L. E. & W. Ry. 33
N. Y. & New England R. R. 33
Niles Tool Works. 2
Norristown Steel Co. 18
Northampton Emery Wheel Co.
North'n Equipment Co. 40
Okonite Co., Ltd 16
Osgood Dredge Co. 18
Paine, Chas. & Sons 12
Pardee Car & Machine Co. 27
Parsons, W. B 1
Passaic Rolling Mill Co. 36
Pedrick & Ayer 9
Peerless Rubber Co 6
Pennsylvania R. R. 33
Pennsylvania Steel Co., N. Y. 1
Pennsylvania Steel Co., Pa. 40
Perry Ventilator Co. 27
Peters, G. D., & Co. 1
Philadelphia Bridge Wks. 36
Phila. Engineer. Wks., Ltd. 15
Phillips, William H. 31
Phœnix Bridge Co. 37
Sprague, Duncan & Hutchinson. 22
Springfield Iron Co 18
Standard Car Coup Co. 28
Standard Nut Lock Co 34
Standard Paint Co. 5
Standard Steel Works. 30
Standard Thermometer Co. 34
Stiles & Parker Press Co. 9
Stonington Line. 13
Stow Flexible Shaft Co. 21
Stow Mfg Co. 21
Taite & Carlton. 35
E. N. Kirk Talcott. 1
Tanite Co.
Taylor Iron & Steel Co. 31
Thomson, J. L., Mfg. Co. 6
Thurmond Car Coupling Co. 28
Trautwine, Jno. C., Jr. 24
Trenton Iron Co 7
Trojan Car Coupler Co. 28
Union Bridge Co. 37
Union Iron Works. 18
Union Switch & Signal Co. 1
Universal Radial Drill Co 17
Valle & Young 18
Van Dorston Cushioned Car Coup. Equip. Co. 27
Von Schon & Garner. 13
Vulcan Iron Works (Chicago) 17
Waddell, J. A. L. 18
Wagner Car Door. 22
Wallis Iron Works. 38
Wants and For Sale 13
Washburn Car Wheel Co. 30
Wason Mfg. Co. 36
Watson & Stillman 6
Wehn Pavement Co. 22
Weir, Fred C. 5
Wellman Iron & Steel Co. 18
Westinghouse Air Brake Co 32
Wharton R. R. Switch Co. 34
White, Jno. A., Co. 5
Whitney, A., & Sons.
Whiton, A. S. 1
Whittlesey, Geo. F 1
Williams, H. A., Mfg. Co. 12
Wiltams, White & Co.
Wilson Bros. & Co. 1
Wilson, Jas. G 40
Wisconsin Central R. R. 12
Wolhaupter, Benj 11
Wood, R. D., & Co. 22
Worthington, Henry R. 21
Yale & Towne Mfg. Co. 1
Youngstown Bridge Co. 37
Youngston Car Mfg. Co. 26
Young & Sons. 13

J. P. COULTER, Pres. and Gen. Mangr. THOS. HIBBERT, Vice-Pres. E. J. COULTER, Secretary and Treasurer.

THE IMPROVED AMERICAN DRAFT AND BUFFING APPARATUS.



It is a fact that it saves over 90 per cent. in repairs to Draft-Rigging, and is in use in more cars and more miles of Railroad and private car companies than all others combined. Send for drawing and references to Company's office.

AMERICAN CONTINUOUS DRAW-BAR CO. (SOLE OWNERS), AURORA, IND.

ESTABLISHED 1854.

CHARLES F. KETCHAM & CO.
27 & 29 NASSAU ST. NEW YORK,
RAILROAD PRINTERS & STATIONERS
KEEP IN STOCK OF MOST APPROVED FORMS
BOOKS FOR STATION AND TRAIN USE.
BAGGAGE RECORD, CASH, FRT. CONDUCTORS CAR LIST, FRT. FORWARDED, FRT. RECEIVED, MANIFEST COPYING, TEL. TRAIN ORDER, &c., &c.
PAPER AND BOOKS FOR ENGINEERS AND CONTRACTORS USE
BLUE PROCESS, CROSS SECTION, DETAILED EST., MD. RETURN, FIELD, LEVEL, TIME, DRAWING, QUANTITY, PROFILE, PAY ROLL, WAGES TABLE, TRACING, TRANSIT, TOPOG., &c., &c.
PRINT, RULE AND BIND IN ANY QUANTITY BLANKS AND BOOKS FOR RAILROADS, AND KEEP STATIONERY FOR ALL.
YOUR ORDERS OR CORRESPONDENCE SOLICITED.

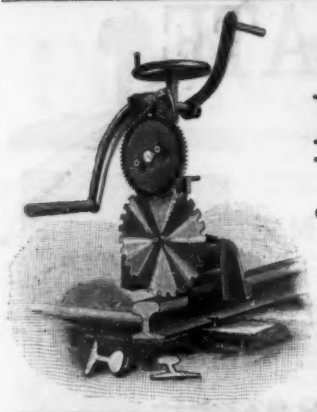
THE WEIR FROG CO. CINCINNATI, O. FRED C. WEIR PRES

SOLE MANUFACTURERS OF FRED C. WEIR'S IMPROVED RIGID & SPRING FROGS, CROSSINGS SINGLE & THREE THROW SPLIT SWITCHES. FIXED & AUTOMATIC SWITCH STANDS. STEEL DIE FORMED RAIL BRACES, SWITCH FIXTURES, ETC

CABLE & ELECTRIC TRACK WORK FROGS, SWITCHES CROSSINGS, CURVES RAIL CHAIRS ETC.

P. & B. WATERPROOF INSULATING PAPERS —FOR— REFRIGERATOR CARS.
Largely Used and Endorsed by the
LARGEST CONSUMERS IN THE WORLD.

THE JOHN A. WHITE COMP'Y
MANUFACTURERS OF STANDARD WOOD-WORKING MACHINERY
DOVER N.H.



BRYANT'S PORTABLE

RAIL SAW.

Guaranteed to Cut ANY Rail from 90 degrees to 45 degrees.

BRYANT & BARBEY,

178 SUMMER ST., BOSTON.

Portable Railroad Drill.

ALSO USEFUL FOR

Bridge Builders,
Cable Road Builders,
Structural Iron Workers.

SAVES TIME AND LABOR.

Write for circulars and full information

FRANK REED,
19 Hermon St., Worcester, Mass.

BRYANT & BARBEY, New England Agents
178 Summer St., Boston.

RAILROAD GAZETTE DIRECTORY: CLASSIFIED ADVERTISEMENTS.

Air Brake Fittings
Stanley G. Flagg & Co., Phila.

Air Brake Hose
N.Y. Belt. & Pack. Co., Ltd.,15 Park Row.
Peerless Rubber Co., 15 Warren St.

Air Brake Regulator
Mason Regulator Co., Boston.

Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10 Park Place, N. Y.
Rand Drill Co., 23 Park Place, N. Y.

Aluminum
Pittsburgh Reduction Co.

Architect
Bradford L. Gilbert, 50 Broadway, N. Y.
Thomas Appleton, 505 Rialto Bldg., Chic.

Architectural Iron Work
King Bridge Co., Cleveland, O.

Asbestos Packing
H. W. Johns Mfg. Co., N. Y. City.

Asphalt Pavement
Wehn Pavement Co., 16 Exch. Pl., N. Y.

Axles
Cambria Iron Co., Johnstown, Pa.
Lima Machine Works, Lima, O.
Louisville Steam Forge Co., Louisv., Ky.
Mich. Forge & Iron Co., Detroit, Mich.
Midvale Steel Co., Nicetown, Phila.
Pittsb'gh Forge & Iror Co., Pittsb., Pa.
T. Prosser & Son, 15 Gold St., N. Y.

Balanced Slide-Valves
M. C. Hammett, Troy, N. Y.

Ballast Unloaders
Marion Steam Shovel Co., Marion, O.

Bankers
Brown Bros. & Co., 59 Wall street, N. Y.

Bell Cord & Couplings
Samson Cordage Works, Boston, Mass.

Boilers
Abendroth&RootMfg.Co.,28Cliff St.,N.Y.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.
Rich. Loco. & Mach. Co., Richmond, Va.

Boiler Plate
Schoenberger & Co., Pittsburgh, Pa.
Wellman Iron & Steel Co ,Thurlow, Pa.

Bolt Cutters
Acme Machinery Co., Cleveland, O.
Howard Iron Works, Buffalo, N. Y.

Bolts & Nuts
Fuller Bros. & Co., 139 Gr'nwich St., N.Y.
Rhode Island Tool Co., Providence.

Books & Publications
E. & F. N. Spon & Co., 12 Cortl'd't St., N.Y.
John C. Trautwine, Jr.

Brake Adjusters
Buckley Brake Co., Trenton, N. J.
Q. & C. Co., Chicago.

Brake Beams
Nat. Hollow Brake Beam Co., Chic., Ill.
Northwestern Equipment Co., Chicago.
Schoen Mfg. Co., Pittsburgh.

Brakes
Boyden Brake Co., Baltimore, Md.
Westinghouse Air-Brake Co., Pittsb.,Pa.

Brake-Shoes
Congdon Brake-Shoe Co., Chicago, Ill.
Ramapo (N. Y.) Wheel & Foundry Co.

Bridges
Anderson & Barr, Jersey City, N. J.
Berlin Iron Bridge Co., E. Berlin, Conn.
Boston Bridge Works, Boston, Mass.
Chicago Bridge & Iron Co., Chicago, Ill.
Cofrode & Saylor, Philadelphia, Pa.
Detroit Bridge & Iron Wks, Det., Mich.
Edge Moor BridgeWks,Wilmington,Del.
Elmira Bridge Co., Elmira, N. Y.
S. W. Frescoln, World Bldg., N. Y.
Keystone Bridge Co., Pittsburgh, Pa.
King Bridge Co., Cleveland, O.
Louisville Bridge & iron Co.,Louisv.,Ky.
Mo. Val. Br. & Ir. Wks., Leavenw., Kan.
Mt. Vernon Bridge Co., Mt. Vernon, O.
New Jersey Steel & Iron Co., Trenton.
Passaic Rolling Mill, Paterson, N. J.
Phœnixville Bridge Co., Phila., Pa.
Pittsburgh Bridge Co.,1105 Owings Bldg., Chicago.
Pottsville Bridge Co., Phila.
Rochester Bridge & Ir. W'ks, Rochester.
A. & P. Roberts & Co., Philadelphia, Pa.
San Francisco Bridge Co., California.
Shafer & Schniglau, Chicago, Ill.
Shiffler Bridge Co., Pittsburgh, Pa.
Socysmith & Co., 2 Nassau street, N. Y.
Union Bridge Co., 18 Broadway, N. Y.
J. A. L. Waddell, Kansas City, Mo.
Wallis Iron Works, Jersey City, N. J.
Youngstown (Ohio) Bridge Co.

Bridge Machinery
Vulcan Iron Works, Chicago.

Bridge Timbers
Alexander McClure, Pittsburgh, Pa.

Buildings
Berlin Iron Bridge Co., E. Berlin, Conn.

Bulldozers
Williams, White & Co., Moline, Ill.

Cars
Allison Mfg. Co., Philadelphia, Pa.
Bloomsburg Car Co., Bloomsburg, Pa.
Osgood Bradley & Sons, Worcester, Mass.
J. G. Brill & Co., Philadelphia, Pa.
Canda Mfg. Co., 11 Pine St., N. Y.
Reginald Canning & Co., 115 B'way, N.Y.
Ensign Mfg. Co., Huntington, West Va.
Erie Car Works (Limited), Erie, Pa.
Harvey Steel Car Co., Chicago., Ill.
Jackson & Sharp Co., Wilmington, Del.
Jackson & Woodin Mfg.Co., Berwick,Pa.
A. S. Males & Co., Cincinnati.
Middletown Car W'ks, Middletown, Pa.
N. Y. Equipment Co., 15 Wall St., N. Y.
R. M. Pancoast, Camden, N. J.
Pardee Car & Mach. Wks,Watsont'n,Pa.
Portland Co., Portland, Me.
South Baltimore Car Works, Baltimore.
St. Charles Car Co., St. Charles, Mo.
Wason Mfg. Co., Springfield, Mass.
Youngstown (Ohio) Car Mfg. Co.

Cars, Second Hand
Reginald Canning & Co., 115 B'way, N.Y.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.

Car Couplings
Auto. Interchangeable Car Coupler Co., San Francisco, Cal.
Buckeye Aut.Car Coup.Co.,Columbus,O.
Drexel Car Coupler Co., Rookery, Chic.
Gould Coupler Co., Buffalo, N. Y.
Hinson Car Coupler Co., Chicago, Ill.
Johnston Car Coupling Co., Phila., Pa.
McConway & Torley Co., Pittsburgh, Pa.
McGill Iron Works Co., Peoria, Ill.
Pratt & Letchworth, Buffalo, N. Y.
St. Louis Car Coupler Co., St. Louis, Mo
Smillie Coupler & Mfg. Co., Newark, N.J.
The Standard Car Coup. Co., Troy, N.Y.
Trojan Car Coupler Co., Troy, N. Y.
Thurmond Car Coup. Co., 80 B'way,N.Y.
Van Dorston Coup. Co., Phila., Pa.

Car Doors
Amer. Car Door Co., Indianap., Ind.
Q. & C. Co., Chicago, Ill.
Wagner Car Door Co., Indianap., Ind.

Car Furnishings
Dayton Mfg. Co., Dayton, O.

Car Heaters
Baker Heater Co., 709 Gr'nwich St., N.Y.
Consol. Car Heating Co., Albany, N. Y.
Gold Car Heat. Co., Frankfort St., N. Y.
Martin A. F. Car-Heat. Co., Dunkirk, N.Y.
Morton Safety Heating Co.
National Car Heating Co., Chicago.
Railroad Lighting & Mfg. Co., Phila.,Pa.
Safety Car H.& Light Co., 160 B'way, N Y

Car Heating Equipment
Stanley G. Flagg & Co., Philadelphia.

Car Machinery
Greenlee Bros. & Co., Chicago.

Car Platform Gates
J. B. Goodwin, 29 B'way, N. Y.

Car Plushes
Sanford Mills, 129 Wash'ton St., Boston.

Car Replacers
Q. & C. Co., Chicago.

Car Roofing
Drake & Weirs, Cleveland, O.
C. B. Hutchin's Sons, Detroit.
Lee Composite Mfg. Co., New York.

Car Seals
Buffalo Seal & Press Co., Buffalo, N. Y.

Car Seats
Hartford Woven Wire Mattress Co., Hartford, Conn.
Hale & Kilburn Mfg. Co., Phila.

Car Upholstering
Knitted Mattress Co., Canton Jct., Mass.

Car Wheel Presses
Tinius Olsen & Co., Philadelphia, Pa.

Car Wheels
Allen Paper Car-Wheel Co., Chicago, Ill.
American Steel Wheel Co., N. Y. City.
Baltimore Car-Wheel Co., Balto., Md.
Barnum & Richardson Mfg. Co., Chic.
Bowler & Co., Cleveland.
Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Davenport & Fairbairn, Erie, Pa.
Dickson Car Wheel Co., Houston, Tex.
C. G. Eckstein & Co., 32 Liberty St. N.Y.
Jersey City Wheel Fd'y & Mach. Works, Lima Machine Works, Lima, O.
Lobdell Car-Wheel Co., Wilmington,Del.
Louis. Car-Wheel Co., Louisville, Ky.
N. Y. Car Wheel Works, Buffalo.
Thos. Prosser & Son, 15 Gold street. N.Y.
RamapoWheel& F'dryCo., Ramapo,N.Y.
Stand. Steel W'ks, 220 So. 4th St., Phila.
Taylor Iron & Steel Co.,High Bridge,N.J.
Washburn Car-WheelCo.,Hartf'd,Conn.
Wason Mfg. Co., Springfield, Mass.
A. Whitney & Sons, Philadelphia, Pa.

Car Window Balance
O. K. Gardner, Box 171, Pittsburgh, Pa.

Cattle Guards
Bush Cattle Guard Co.,Kalamazoo,Mich
Kalamazoo R. R. Veloc. & Car Co., Kalamazoo, Mich.
Wolhaupter, Benj., 39-43 Washington St., Chicago, Ill.

Chemists
Pittsb. Testing Laboratory, Pittsb., Pa.

Coal Chute
Williams, White & Co., Moline, Ill.

Coal Transferring
C. W. Hunt Co., 45 Broadway, New York.

Consulting Engineers
Thomas Appleton, 505 Rialto Bldg., Chic.
G. Bouscaren, Cincinnati, O.
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Frescoln, World Bldg., N. Y.
Geo. L. Fowler, 53 Broadway, N. Y.
Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
F. H. Smith, 227 E.German St., Balto., Md.
Von Schon & Garrer, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.

Consulting Electrical Engineers
Sprague, Duncan & Hutchinson, N. Y.

Conveyors
Link Belt Eng. Co., Nicetown, Phila.

Copper
Hendricks Bros., 49 Cliff street, N. Y.

Cordage
Samson Cordage Works, Boston, Mass.

Cranes
Industrial Works, Bay City, Mich.
John N. Poage, Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
Yale & Towne Mfg.Co., Stamford, Conn.

Creosoting
Creosote Lumber & Construction Co. Fernandina, Fla.
LehighValley Creo.W'ks,P. Amboy,N.J.

Crossings
Fontaine Crossing Co., Detroit, Mich.

Crossing Gates
Bogue & Mills Mfg. Co., Chicago.

Culvert Pipe
Blackmer & Post, St. Louis, Mo.

Draft Rigging
Schoen Mfg. Co., Pittsburgh, Pa.

Drawbar Attachment
Amer. Cont. Draw-Bar Co., Aurora, Ind.
American Steel Wheel Co., N. Y. City.
Butler Drawbar Attach. Co., Cleveland.
Hinson Drawbar Attach. Co., Chicago.

Dredging Machinery
Bucyrus (O.) Steam Shovel & Dredge Co.
San Francisco Bridge Co., Calif.rnia.
Vulcan Iron Works, Chicago.

Drop Forgings
Billings & Spencer Co., Hartford, Conn.

Electric Crossing Signal
Electric Supply & Mfg. Co., Clevel'd, O.

Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.

Elevators
Link Belt Eng. Co., Nicetown, Phila.

Emery Wheels
N.Y. Belt. & Pack.Co., Ltd.,15 Park Row.
Northampton Emery W.Co.,Leeds,Mass.
Tanite Co., Stroudsburg, Pa.

Engineering Employment Bureau
Engineer. Employm't Bureau, 8 Granger Block, Syracuse, N. Y.

Engineering Instruments
Chas. H. Brightly, Philadelphia, Pa.
Keller & Brightly Philadelphia, Pa.
C. F. Ketcham & Co., 27 Nassau St., N. Y.
Keuffel & Esser, New York City.
Queen & Co., Philadelphia Pa.
Young & Sons, Philadelphia, Pa.

Engineers
Thomas Appleton, 505 Rialto Bldg.,Chic.
G. Bouscaren, Cincinnati, O.
D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
S. W. Frescoln, World Bldg., N. Y.
Geo. L. Fowler, 53 Broadway, N. Y.
Albert Lucius, 71 Broadway, N. Y.
W. B Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
Pittsb. Test. Laboratory, Pittsb., Pa.
F. H. Smith, 227E.German St., Balto.Md.
E. N. K. Talcott, 57 Broadway, N. Y.
Von Schon & Garrer, Fredericksb., Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.

Engines
Fishkill Landing Mch. Co., Fishkill,N.Y.
Philadelphia Engineering Wks., Phila.

Excavators
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Marion Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N. Y.
J. Souther & Co., Boston, Mass.
Vulcan Iron Works, Chicago.

Explosives
Rendrock Powd.Co., 23 Park Place, N.Y

Feed-Water Purifier
Field Water Purifier Co., Chicago.

Fences
Barkly & House, Chicago, Ill.

Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.

Fluoride
Amer. Fluoride Co., 126 Liberty St., N.Y.

Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N. Y.

Freight Conveyors
Industrial Works, Bay City, Mich.

Forges
The Foos Mfg. Co., Springfield, O.

Frogs and Crossings
Allentown Rolling Mill, Allentown, Pa.
Cleveland (O.) Frog & Crossing Co.
Elliott Frog & Sw. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Hillburn, N. Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.

Furnaces
Abendroth & Root M.Co.,28 Cliff St.,N.Y.

Gauges (Pressure)
Ashcroft Mfg. Co., 111 Liberty St., N. Y.

Grader, Ditcher & R. R. Builder
F. C. Austin Mfg. Co., Chicago, Ill.

Guarantee Co.
Guarantee Co. of N. A., Montreal.

Hand Cars
The Buda Fdy & Mfg. Co., Harvey, Ill.
Fairbanks, Morse & Co., Chicago.
Kalamazoo (Mich.) R. R. Veloc. Co.
Sheffield Velocipede Car Co., Three Rivers, Mich.

Harbor Works
S. W. Frescoln, World Bldg., N. Y.

Highway Crossing Signals
Electric Supply & Mfg. Co., Clevel'd, O

Hoisting & Conveying Machinery
Brown Hoisting & Conveying Mach. Co., Cleveland, O.
C.W. Hunt Co., 45 B'way, New York.
King Bridge Co., Cleveland, O.
Lidgerwood Mfg. Co., 96 Lib'ty S.t., N.Y
Link Belt Machinery Co., Chicago, Ill.

Hoisting Engines
Copeland & Bacon, New York City.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St.,N.Y
J. S. Mundy, Newark, N. J.
Vulcan Iron Works Chicago.

Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.

Hydraulic Jacks
Richard Dudgeon, 24 Columbia St., N. Y
Joseph F. McCoy Co., 26 Warren St., N.Y
Watson & Stillman, 210 E. 43d St., N. Y.

Hydraulic Machinery
Tinius Olsen & Co., Philadelphia, Pa.
Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
R. D. Wood & Co., Philadelphia, Pa.

Injectors
Nathan Mfg. Co., 94 Liberty street, N. Y.
Wm. Sellers & Co., Philadelphia.

Inspectors
Pittsb. Test. Laboratory, Pittsb., Pa.

Inspectors of Bridges and Ry. Equipment
R. W. Hildreth & Co., 2 Wall St., N. Y.

Insurance
Hart. S. Boiler Insp. & Ins. Co., Hartford
Royal Ins. Co., 30 Wall street, N. Y.

Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa.
Hall Signal Co., 59 B'way, N. Y.
Kelsey R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh.
Wharton R. R. Switch Co., Phila.

Iron--Taylor Yorkshire
B. M. Jones & Co., Boston, Mass.

Iron Work for Contractors
Edge Moor Bridge Wks,Wilmington,Del.
King Bridge Co., Cleveland, O.

Iron & Steel Ship Builders
Union Iron Works, San Francisco.

Jacks
Fairbanks, Morse & Co., Chicago.
McSherry Mfg. Co., Dayton, O.
Richard Dudgeon, 24 Columbia St., N. Y
Watson & Stillman, 210 E. 43d St., N. Y.

Journal Bearings
Ajax Metal Co., Philadelphia, Pa.
D. A. Hopkins Mfg. Co., 143 Liberty St. N. Y.
Phosphor-Bronze Smelting Co., Philada.
Paul S. Reeves, Philadelphia, Pa.

Journal Bearings--Tubular
Meneely Bearing Co., W. Troy, N. Y.

Journal-Box Lids
Ramapo (N. Y.) Wheel & F'dry Co.

Lighting
Adams & Westlake Co., Chicago.
Railroad Lighting & Mfg. Co., Phila.,Pa.
Safety Car Heat. & Light. Co., 160 B'way,

Link Belting
Link Belt Eng. Co., Nicetown, Phila.

Lock Washers
Nat. Lock Washer Co., Newark N. J.

SCALE

In Boilers

PREVENTED BY

FLUORIDE.

AND BOILER COMPOUND.

AMERICAN FLUORIDE COMPANY,

126 Liberty Street, New York. Western Office, 73 & 75 W. Jackson Street, Chicago, Ill.

WILL SEND YOU CIRCULAR AND SAMPLE.

Peerless Rubber Mfg. Co.

President: E. L. PERRY.

Treasurer: W. G. WINANS.

RAINBOW AND PEERLESS PACKING.

RAINBOW TRADE MARK.

STEAM HOSE AND AIR BRAKE HOSE,

Guaranteed for two years.

ECLIPSE GASKET.

C. H. DALE, General Sales Agent.

OFFICE, 15 WARREN STREET, N. Y.

Sectional view.

THOMSON'S SLOTTED RIVETS.

Sectional view when set.

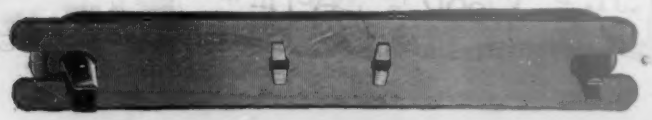
The *only* rivet in the *world* that can be set without a machine.

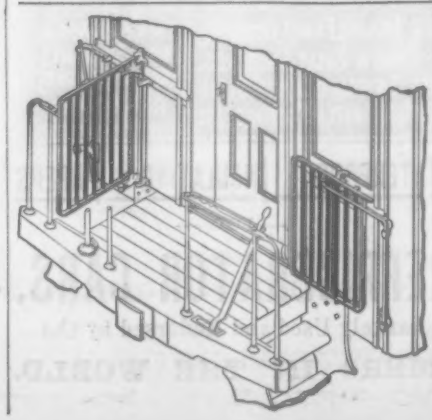
For fastening Belts, Straps and other articles made of Leather, Rubber, Canvas, Felt, Pasteboard, Sheet Iron or Wood.

SIZES 3/16, 1/4, 5/16, 6/16, 7/16, 8/16, No. 9 Wire Gauge.

SIZES 4/16, 5/16, 6/16, 7/16, 8/16, 9/16, 10/16, 11/16, 12/16, No. 6 Wire Gauge.

JUDSON L. THOMSON MFG. CO.,
WALTHAM, MASS.





Blown Off the Cars.

This cannot happen to passengers where cars are equipped with the

WOOD PLATFORM GATE.

4,000 NOW IN USE.

J. B. GOODWIN, Sole Agent

29 Broadway, New York.

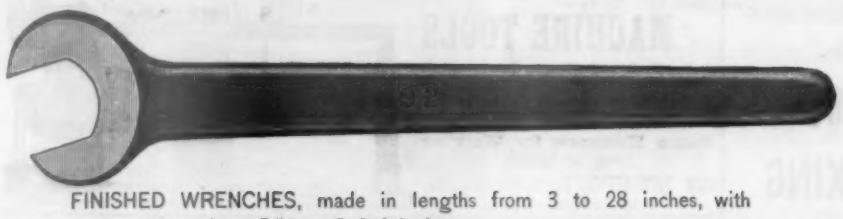
Manufactured by R. BLISS MFG. CO., PAWTUCKET, R. I.

Malleable-Iron, Cast-Iron, Wrought-Iron and Steel Fittings

FOR WROUGHT-IRON PIPE.
Keystone Soft-Metal Union.
Ready for immediate use. Requires no washer. Can be made tight with but little pressure.

STANLEY G. FLAGG & CO.,
Nineteenth St., Penna. Ave. and Hamilton St., Philadelphia, Pa.

MANUFACTURERS OF
STEEL AIR-BRAKE FITTINGS.
Guaranteed air-tight, threads full and sharp, made from templets to standard gauge.
SPECIFY
FLAGG STEEL FITTINGS
FOR AIR-BRAKE CONNECTIONS.



FINISHED WRENCHES, made in lengths from 3 to 28 inches, with openings from 5/16 to 2 3/4 inches.
QUALITY AND FINISH UNEQUALLED.

DROP FORGED, ANGLE END
Machine Wrenches,
FOR STANDARD HEXAGON NUTS.
THE BILLINGS & SPENCER CO.
HARTFORD CONN.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS

Locomotives
Baldwin Locomotive Works, Philada.
Brooks Locomotive W'ks, Dunkirk, N.Y.
Cooke Loco. & Mach. Co., Paterson, N.J.
Dickson Mfg. Co., Scranton, Pa.
G. L. Fowler, 53 Broadway, N. Y.
Lima Machine Works, Lima, O.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pittsburgh Loco. & Car W'ks, Pittsburgh.
H. K. Porter & Co., Pittsburgh, Pa.
Portland Co., Portland, Me.
Richmond (Va.) Loco. & Mach. Works.
Rogers Loc. & Mach. Wks., Paterson, N. J.
Schenectady (N. Y.) Loco. Works.
Talte & Carlton, London, Eng.
Wharton R. R. Switch Co., Phila.

Locomotive Boiler Tubes.
Allison Mfg. Co., Philadelphia, Pa.

Locomotive Finishing Varnish
Flood & Conklin, Newark, N. J.

Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.

Locomotives, Second-Hand
Reginald Canning & Co., 115 B'way, N.Y.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.

Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Lubricators
Detroit Lubricator Co., Detroit, Mich.
Nathan Mfg. Co., 92 Liberty street, N. Y.

Machinists' Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence,
Ferracute Machine Co., Bridgeton, N. J.
Gould & Eberhardt, Newark, N. J.
Edw. Harrington, Son & Co., Phila.
Hayes Tool Co., Portland, Me.
Long & Allstatter Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St.,
Morse Tw. Dr. & Mach. Co., N. Bed'd, Mass.
Newark Mach. Tool Wks., Newark, N. J.
Niles Tools Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Place, 120 Broadway, N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Wm. Sellers & Co., Philadelphia.
Stiles & Parker Press Co., Middletown, Conn.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Universal Radial Drill Co., Cincinnati.
Watson & Stillman, 210 E. 43d St., N. Y.
Wharton R. R. Switch Co., Phila.

Malleable Iron Castings.
National Malleable Castings Co., Cleveland.

Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Mining Machinery
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Union Iron Works, San Francisco.

Mop Wringer
Boston Wringer Co., Boston.

Nut Locks
Amer. Washer & Mfg. Co., Newark, N. J.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark.
Ruffner & Dunn, Philadelphia, Pa.
Standard Nut Lock Co., N. Y.

Oil
Signal Oil Works, Ltd., Franklin, Pa.

Oil Cans
Adams & Westlake Co., Chicago.
Bryant & Barbey, 178 Summer St., Boston.
H. A. Williams Mfg. Co., Boston.

Ore Handling Machinery.
King Bridge Co., Cleveland, O.
Lidgerwood Mfg. Co., 96 Lib'ty St., N.Y.

Packing, Asbestos
R. W. Johns Mfg. Co., N. Y. City.

Packing-Rubber
N. Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Peerless Rubber Co., 15 Warren St.

Paint
Andress Paint & Color Co., 15 Cortlandt street, N. Y.
F. W. Devoe & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N.J.
Nat. Paint Works, Williamsport, Pa.
Standard Paint Co., 2 Liberty St., N. Y.

Patents
Howson & Howson, 119 So. 4th St., Phila.
Geo. P. Whittlesey, Washington, D. C.

Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.

Pile Drivers
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
Vulcan Iron Works, Chicago, Ill.

Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.

Pneumatic Foundations
S. W. Frescoln, World Bldg., N. Y.

Portable Drills
Jas. T. Habey, Philadelphia, Pa.
Frank Reed, Worcester, Mass.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.

Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.

Pumps
Fairbanks, Morse & Co., Chicago.
Laidlaw & Dunn Co., Cincinnati, O.
R. D. Wood & Co., Philadelphia, Pa.
H. R. Worthington, 86 Liberty St., N. Y.

Radial Taps
T. Y. Connelly, Milton, Pa.

Rails
Bethlehem Iron Co., 80 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayes, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh, Pa.
A. S. Whiton, 115 Broadway, N. Y.

Rail Fastenings
Cambria Iron Co., Johnstown, Pa.
Fisher Rail-Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N.J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.

Rail Joints
Cont. Rail Joint Co. of Amer., New'k, N.
Eno Rail Joint Co., Newark, N. J.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
McConway & Torley Co., Pittsburgh, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Q. & C. Co., Chicago, Ill.

Railroad and Transp. Lines
Big Four.
Boston & Albany.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & St. Paul.
Chicago & Northwestern.
Chicago, Rock Isl. & Pacific.
C., H. & D.
Hoosac Tunnel Route.
Illinois Central.
Lehigh Valley R. R.
Michigan Central.
Missouri Pacific.
New York Central & Hudson River.
New York, Lake Erie & Western.
New York & New England R. R.
Pennsylvania.
Stonington Line.

Railroad Printing
C. F. Ketcham & Co., 27 Nassau St., N. Y.

Railroads, Building & Equipping
L. Breckinridge Cabell, 53 B'way, N. Y.

Railroad Supplies
Bryant & Barbey, 79 Milk St., Boston.
Reginald Canning & Co., 115 B'way, N.Y.
Fairbanks, Morse & Co., Chicago.
E. S. Greeley & Co., 7 Dey St., N. Y.
The Johnson R. R. Signal Co., Rahway.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
G. D. Peters & Co., London, England.
A. T. Shoemaker, Chicago and N. Y.

Rail Saws
Bryant & Barbey, 178 Summer St., Boston.
Industrial Works Bay City, Mich

Railway Varnishes & Surfacers
Flood & Conklin, Newark, N. J.

Ratchet Drills
Billings & Spencer Co., Hartford, Conn.
Schuttler Mfg. Co., Chicago.

Reducing Valves
Curtis Regul. Co., 89 Beverly St., Boston.
Mason Regulator Co., Boston, Mass.

Refined Iron
Falls Hollow Staybolt Co.

Refrigerator Cars
R. M. Pancoast, Camden, N. J.
So. & Pac. Refrigerator Car Co., Chicago.

Refrigerating Machinery
The La Vergne Refrig. Machine Co., N.Y

Rivets, Slotted
J. A. Thomson Mfg. Co., Waltham, Mass.

Road Scrapers
Amer. Steel Scraper Co., Sidney, O.

Rock Ballast and Rock Breakers
Gates Iron Works, Chicago, Ill.

Rock Drills
Ingersoll-Sergeant Rock Drill Co., N. Y.
Rand Drill Co., 23 Park Place, New York.

Rolling Steel Shutters
Jas. G. Wilson, 74 W. 23d St., New York.

Roofing
East. Gran. Roofing Co., Jersey City, N.J.

Roofs
Berlin Iron Bridge Co., E. Berlin, Conn.
King Bridge Co., Cleveland, O.

Rolling Journal Bearings
Mencely Bearing Co., W. Troy, N. Y.

Rolling Stock to Lease
Oliver Adams, 32 Liberty St., N. Y.

Rubber Belting
N. Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Peerless Rubber Co., 15 Warren St.

Safety Valves
Ashton Valve Co., Boston, Mass.

Saw Mills
Richmond (Va.) Loco. & Mach. Wks.

Schools, Technical
Rensselaer Polytechnic Inst., Troy, N.Y.

Second-Hand Rolling Stock
A. S. Males & Co., Cincinnati.

Sewerage
J. J. R. Croes, 13 William St., N. Y.

Sewer Pipe
Blackmer & Post, St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.

Shafting
Wm. Sellers & Co., Phila.

Signals.
Hall Signal Co., 59 Broadway, N. Y.
Johnson R. R. Signal Co., Rahway, N. J.
Kelsey R. R. Signal Co., Florence, Mass.
Kinsman Bl'k System Co., 143 Liberty St.
Mozier Safety Signal Co., Galion, O.
Nat. Switch & Sig Co., So. Bethlehem, Pa
Union Switch & Signal Co., Pittsburgh

Skylights
Valle & Young, 329 No. St. Baltimore, M

Snow Shovels and Plows
Jull Mfg. Co., Brooklyn.

Solid Staybolt Iron
Falls Hollow Staybolt Co., Cuyaho Falls, O.

Spikes
Dilworth, Porter & Co., Pittsburgh, P
Q. & C. Co., Chicago.
Morris Sellers & Co., Chicago.

Springs
Farist Steel Co., Bridgeport, Conn.
A. French Spring Co., Pittsburgh, Pa.
Pickering Spring Co., Philadelphia.
Chas. Scott Spring Co., Philadelphia, Pa.

Stand Pipes
John N. Poage, Cincinnati, O.
King Bridge Co., Cleveland, O.
Sheffield Veloc. Car Co., Three Rivers, Mich.

Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Fuller Bros. Co., N. Y.
R. M. Jones & Co., Boston & N. Y.

Steam Coupling
Moran Flex. Steam Joint Co., Louisville, Ky.

Steam Dredges
Bucyrus (O.) St'm Shovel & Dredge Co

Steel Car Channels
Cambria Iron Co., Johnstown, Pa.

Steel—Musket's
R. M. Jones & Co., 11 Oliver St., Boston.

Steel Castings
Chester Steel Castings Co., Philad'a., Pa.
Eureka Cast Steel Co., Philad'a, Pa.
Norristown Steel Co., Norristown, Pa.
Sharon Steel Castings Co., Sharon, Pa.
Solid Steel Co., Alliance, O.
Pratt & Letchworth, Buffalo, N. Y.

Steel Centre Plates
Schoen Mfg. Co., Pittsburgh, Pa.

Steel and Iron Plates
Lukens Iron & Steel Co., Coatesville, Pa.
Wellman Iron & Steel Co., Thurlow, Pa.

Steel and Steel Tires
Latrobe Steel Works, Latrobe, Pa.
Midvale Steel Co., Nicetown, Phila.
Thos. Prosser & Son, 15 Gold St., N. Y.
Standard Steel Works, Philadelphia, Pa.

Switches and Switch Stands
Allentown Rolling Mill, Allentown, Pa.
Elliott Frog & Switch Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co.
Kelsey R. R Signal Co., Florence, Mass.
Nat. Switch & Sig. Co., So. Bethlehem, Pa
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ramapo, N. Y.
Sheffield Veloc. Car Co., Three Rivers, Mich.
Union Switch & Sig. Co., Pittsburgh, Pa.
Weir Frog Co., Cincinnati, O.

Tanks (Cedar)
G. L. Burkhardt's Sons, Philadelphia, Pa
Fairbanks, Morse & Co., Chicago.

Tank Valves
John N. Poage, Cincinnati, O.

Taps and Dies
D. Saunders' Sons, Yonkers, N. Y.
Manning, Maxwell & Moore, 111 Lib. N. Y.

Testing Laboratory
Pitts. Testing Laboratory, Pittsburgh, Pa

Telegraph Call-Bell System
Electric Secret Service Co., N. Y. City
Gill-Alexander Electric Mfg. Co., Kansas City, Mo.

Thermometers
Standard Therm. Co., Peabody, Mass.

Tie Plates
Q. & C. Co., Chicago.
Shoulder Tie Plate Co., Philadelphia, P

Track Tools
Fairbanks, Morse & Co., Chicago.
Metcalf, Paul & Co., Pittsburgh, Pa.

Transfer Tables
Industrial Works, Bay City, Mich.

Turn Buckles
Cleveland City Forge & Iron Co., Cleveland, O.

Turn Tables for Railways
Cofrode & Saylor, Philadelphia, Pa.
Industrial Works, Bay City, Mich.
King Bridge Co., Cleveland, O.
A. S. Males & Co., Cincinnati.
Passaic Rolling Mill Co., Paterson, N. J
Wm. Sellers & Co., Phila. and N. Y.
Shiffler Bridge Co., Pittsburgh, Pa.

Valves
Ashton Valve Co., Boston.
Curtis Regulator Co., Boston, Mass.
Mason Regulator Co., Boston, Mass.
Ross Valve Co., Troy, N. Y.
R. D. Woods & Co., Philadelphia, Pa

Varnishes
F. W. Devoe & Co., Fulton street, N. Y
Flood & Conklin, Newark, N. J.
Murphy & Co., Newark, N. J.
Edw. Smith & Co., Times Bldg., N. Y.

Ventilators
Q. & C. Co., Chicago.
Perry Ventilator Co., 115 B'way, N. Y.

Washers and Rivets
Fuller Bros. & Co., 139 Greenwich St., N.Y

Water Columns
J. N. Poage, Cincinnati, O.
Sheffield V. Car Co., Three Rivers, Mich

Waterproof Insul. Papers
Standard Paint Co., 2 Liberty St., N. Y.

Water Supply
J. J. R. Croes, 13 William St., N. Y.

Window Sash Cord
Samson Cordage Works, Boston, Mass.

Wire, Insulated
Okonite Co. (Ltd.), N. Y.

Wire Rope
Trenton Iron Co., Trenton, N. J.

Wood Working Machinery
Berry & Orton Co., Philadelphia, Pa.
Egan Co., Cincinnati, O.
J. A. Fay & Co., Cincinnati, O.
Greenlee Bros. & Co., Chicago.
John A. White Co., Dover, N. H.

Wrecking Cars
Bucyrus Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.

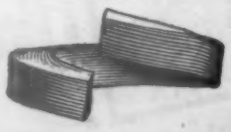
Wrenches
Billings & Spencer Co., Hartford, Conn
Rhode Island Tool Co., Providence, R. I

MORAN FLEXIBLE STEAM JOINT CO.,
HENRY U. FRANKEL, President 149 Third St. Louisville, Ky.
ALL-METAL REVERSIBLE PISTON COUPLING. NO HOSE. NO SPRINGS. USED IN CONNECTION WITH FLEXIBLE BALL JOINTS FOR CONVEYING STEAM FROM COACH TO COACH
Applicable to EVERY SYSTEM of STEAM HEATING
BLUE PRINTS AND JOINTS ON APPLICATION

THE AMERICAN WASHER & MANUFACTURING CO.,
13 & 15 RAILROAD PLACE, NEWARK, N. J.
EDWIN W. HINE, President. L. L. STURGES, Secretary and Treasurer. H. A. HARVEY, Vice-President.

The American Harvey No. 1 Nut Lock, a resilient spring washer with chisel cutting edges. Patented. Tempered in oil.

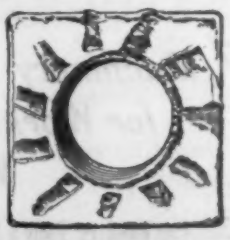
SQUARE.



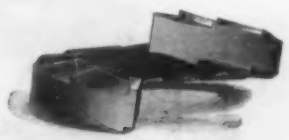
The American "No. 2 Square" Plain Spring, answers the purpose of all ordinary spring washers. Above pattern made of either round or square steel. Tempered in oil.

Our claim for this lock, aside from the unexcelled spring quality it possesses (being tempered in oil) is the tangential cutting or ratchet ribs on either side, and reversed, so that when the nut is set down these ribs are embedded in both fish plate and under face of nut to such extent that a removal of the nut by force (and it can only be done with force) will show annular grooves plowed on surface of both nut and fish plate (see cuts above) without disturbing the thread of either nut or bolt, both of which, together with the nut lock, can be used again. This is a positive lock, with spring temper, and will not cut thread of nut or bolt.

THE AMERICAN "HARVEY RIBBED" NUT LOCK.
A Resilient Spiral Spring Washer with Rachet-Shaped Teeth.



Patented.



CORRESPONDENCE AND ORDERS SOLICITED. SAMPLES FURNISHED FREE ON APPLICATION AND SENT TO ANY ADDRESS.

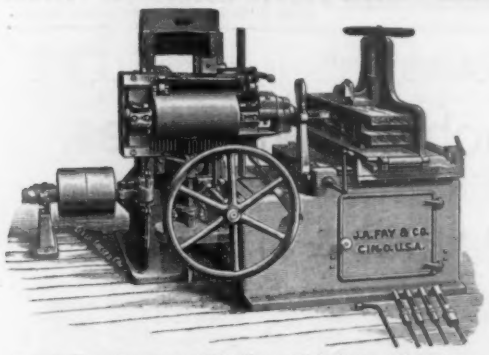
W. H. DOANE, Prest. D. L. LYON, Sec'y.

J. A. FAY & CO.,

CINCINNATI, O., U. S. A.

—CAN FURNISH—

Car, Locomotive and Railway Shops



No. 3 New Improved Hollow Chisel Car Mortiser.

—AWARDED—

"Grand Prix," Universal Exposition, Paris, 1889.

4 GOLD AND SILVER MEDALS AT

Chicago Railway Exposition of 1883.

◆ ◆ ◆

Complete Equipments

—OF—

WOOD-WORKING MACHINERY.

◆ ◆ ◆

Catalogues and Estimates Furnished upon Application.

ACME MACHINERY CO.,

CLEVELAND, OHIO,

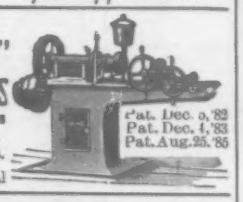
Manufacturers of

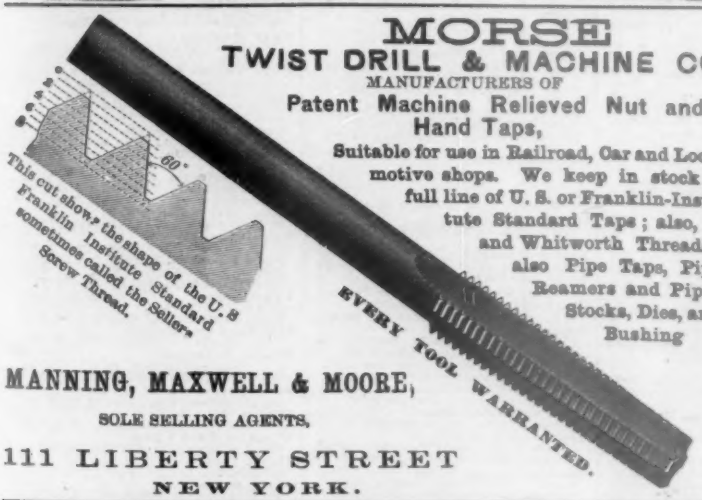
ACME BOLT & RIVET HEADERS

Acme Single & Double Automatic Bolt Cutters Cutting from ⅛ in. to 6 in. diam.

Also, SEPARATE HEADS and DIES.

First Premium Cincinnati Centennial




60°
This cut shows the shape of the U. S Standard Franklin Institute Standard sometimes called the Sellers Screw Thread.
EVERY TOOL WARRANTED.

MORSE TWIST DRILL & MACHINE CO

MANUFACTURERS OF

Patent Machine Relieved Nut and Hand Taps,

Suitable for use in Railroad, Car and Locomotive shops. We keep in stock a full line of U. S. or Franklin-Institute Standard Taps; also, V and Whitworth Threads also Pipe Taps, Pipe Reamers and Pipe Stocks, Dies, and Bushing

MANNING, MAXWELL & MOORE,

SOLE SELLING AGENTS,

111 LIBERTY STREET

NEW YORK.

Morse Twist Drill & Mch. Co.

Established 1864. New Bedford, Mass.

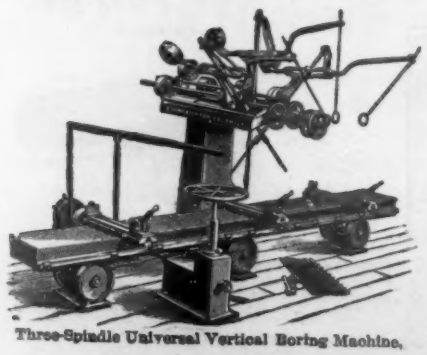
Manufacturers of Drills for Metal or Wood, Reamers, Taps, Dies, Beach Chucks, Cutters, Drill Grinding Machines, and Special Tools.

CATALOGUES MAILED ON REQUEST

BERRY & ORTON CO.,

ATLANTIC WORKS,

Twenty-Second above Arch St., PHILADELPHIA, PA.



Three-Spindle Universal Vertical Boring Machine.

Designers and Manufacturers of

Machinery for Working Wood.

Car Builders' Tools a Specialty.

Drawings and Estimates furnished upon application.

BEMENT, MILES & CO.

PHILADELPHIA, PA.,

—BUILDERS OF—

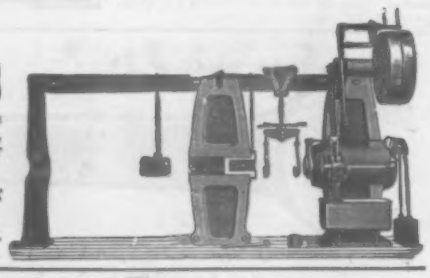
METAL-WORKING MACHINE TOOLS

For Railroad Shops, Locomotive and Car Builders, Machine Shops, Steam Forges, Ship Yards, Boiler Shops, Bridge Works, etc.

Steam Hammers for Working Iron or Steel.

NEW YORK OFFICE, EQUITABLE BUILDING.

GEORGE PLACE, Agent.



HYDRAULIC PRESSES,

Adjustable Crank Pin Press.

For Forcing Car Wheels, Crank Pins, &c., &c.

Hydraulic Jacks.

INFERIOR TO NONE.

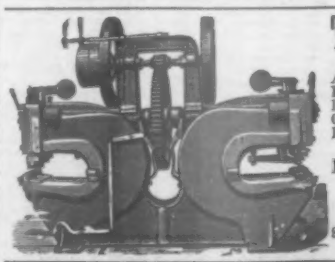
Largest Variety.

PORTABLE HYDRAULIC PUNCHES

For Bridge and Beam Work.

WATSON & STILLMAN,

210 East Forty-third Street, - - - -New York City.



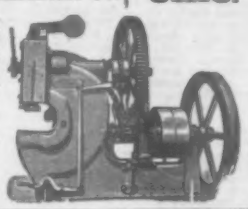
The Long & Allstatter Co., HAMILTON OHIO.

Double, Single, Angle-Bar, Gang, Horizontal, Twin, Boiler, Spacing, Gate, Multiple, Belt and Steam-Driven

Punches & Shears.

Over 300 Sizes.

Send for New Catalogue.

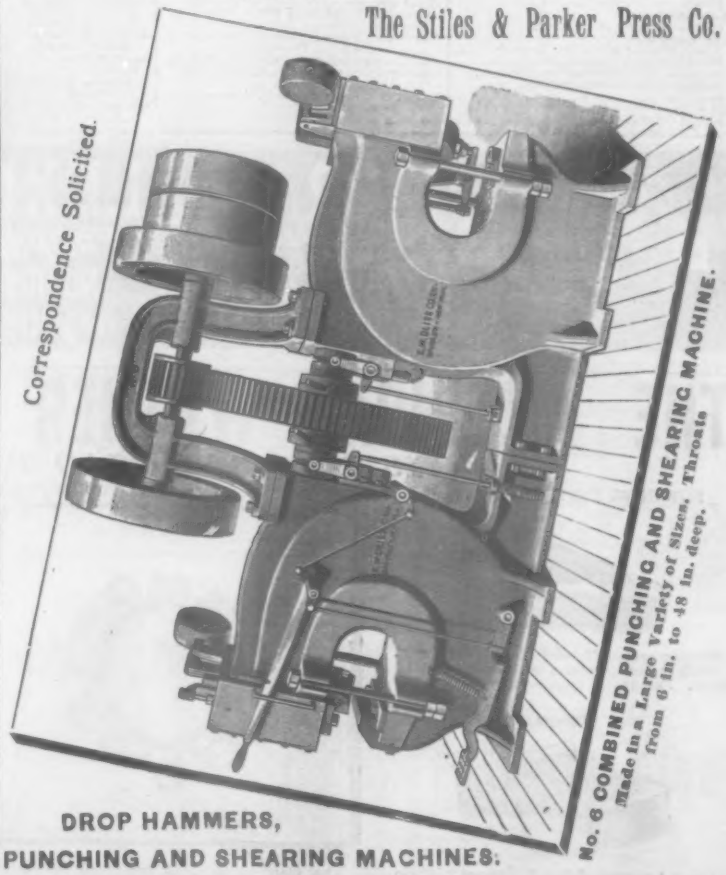


E. W. BLISS CO., LTD.,

No. 6 ADAMS ST., BROOKLYN, N. Y.

OWNERS ALSO OF

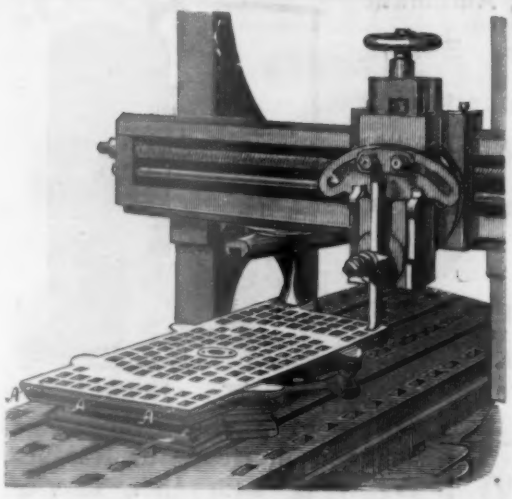
The Stiles & Parker Press Co.


Correspondence Solicited.
No. 6 COMBINED PUNCHING AND SHEARING MACHINE.
Made in a Large Variety of Sizes. Throats from 6 in. to 48 in. deep.

DROP HAMMERS,

PUNCHING AND SHEARING MACHINES.

Dies and Special Machinery for Lamps, Car Trimmings, Tanks, Railroad Ties, Fish Plates, Etc.



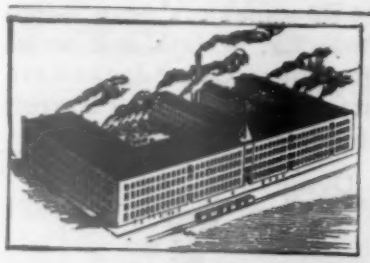
Radius Link Planer Attachment.

This attachment is used in planing curves of any radius, and perfectly parallel curves, as applied to the ordinary planing machine. Quickly attached; easily operated; does accurate work.

FOR CIRCULARS AND PRICES ADDRESS

PEDRICK & AYER,

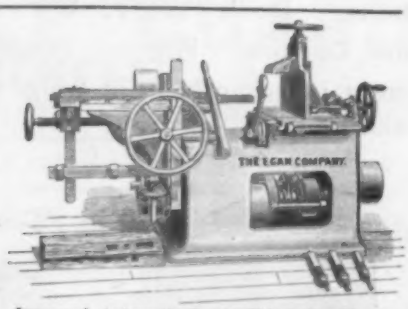
1001 and 1003 HAMILTON STREET, PHILADELPHIA, PA.



THE EGAN COMPANY,

202 to 222 West Front St.,

CINCINNATI, OHIO, U. S. A.



Improved Automatic Square Chisel Car Mortiser and Borer. The Chisel Mandrel is driven by a New Improved Friction and Gearing, with a quick return, and raised and lowered by rack and pinion.

BUILDERS AND ORIGINATORS OF LATE IMPROVED

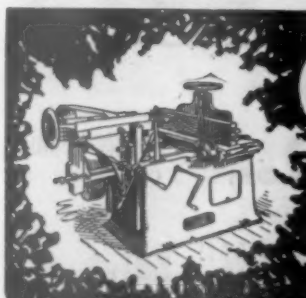
WOOD-WORKING MACHINERY

For CAR SHOPS, CAR BUILDERS, RAILROAD REPAIR SHOPS, Etc.

SEND FOR CIRCULARS AND INFORMATION. CATALOGUE FURNISHED IF DESIRED.

Floorers, Cut-off Saws, Band Re-Saws, Borers, Molders.

Sill Dressers, Car Tenoners, Gaining Machines, Hollow Chisel Mortisers, etc.



Greenlee Bros. & Co.

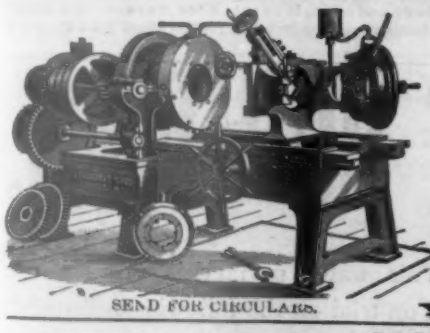
SPECIAL WOOD WORKING MACHINERY.

SEND FOR DESCRIPTION OF OUR NEW

AUTOMATIC CAR MORTISERS, AND FOUR SPINDLE CAR GAINER BORING MACHINE. DOUBLE CUT-OFF MACHINE

CHICAGO.

D. SAUNDERS' SONS



MANUFACTURERS OF

Pipe Cutting and Threading Machines

For Pipe Mill and Steam Fitters' Use.

Tapping Machines

For Steam Fitting. Also,

STEAM AND GAS FITTERS HAND TOOLS.

31 Atherton Street.

Send for Catalogue B.

SEND FOR CIRCULARS.

YONKERS, N. Y.

RICHARD DUDGEON,

24 COLUMBIA ST., NEW YORK.

Maker and Patentee of

Improved Hydraulic JACKS.

PUNCHES, BOILER-TUBE EXPANDERS AND DIRECT-ACTING

Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for Pressing on Car Wheels or Crank Pins made to order.

MAXON Pat. JACKS

Lever and Screw

Unequaled for all varieties of

RAILROAD WORK.

Our Drop Track Jack Beats anything of that line now in market.

MANUFACTURED BY

THE McSHERRY MFG. CO.,

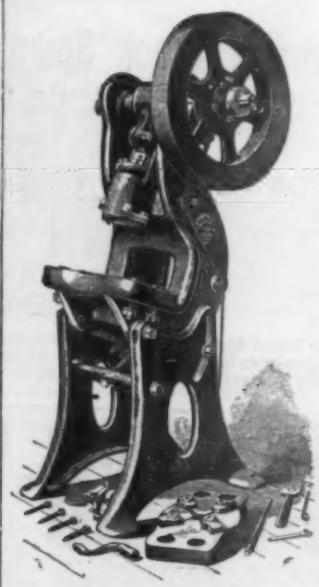
DAYTON, OHIO.

GATES ROCK AND ORE BREAKER.

See Large Advertisement in Last or Next Issue of This Paper.

GATES IRON WORKS, 50a So. Clinton St., Chicago, Ill., U. S. A.

Large Special "PUNCHES" and "SHEARERS" for Bridge and Girder Work, Iron Buildings, etc., etc.



Foot Screw and Drop. Also Cutting, Punching, Forming, Shearing, Embossing, Coining and Drawing

PRESSES

OF ALL SIZES AND KINDS.

DRAWING PRESSES and DIES

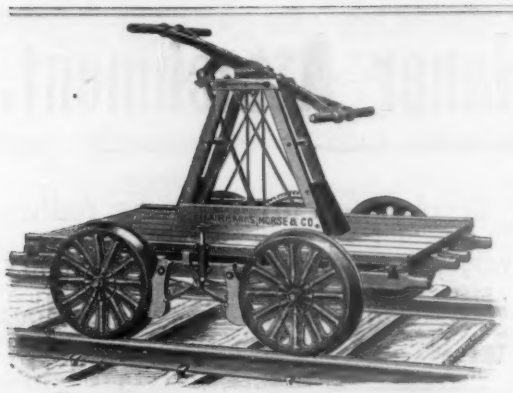
For Lanterns, Lamps, Tinware, Brass Goods, etc.

FERRACUTE MACHINE CO.,

BRIDGETON, N. J., U. S. A.,

Manufacturers of all kinds of Presses, Dies and other Tools for Sheet and Bar Metals.

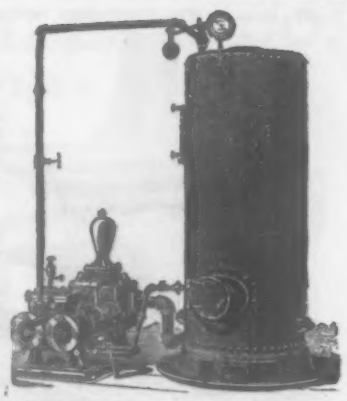
Please Send for their Illustrated Price Lists, describing 150 kinds of Presses, Lathes, Rolls, Beaders, Trimmers, etc.



SECTION CARS with Pressed Steel Wheels, made from single-piece tough plate, free from joints, angles and bolts. Don't Warp, Shrink nor Collapse. Highest attainment in strength, light weight, durability.

WATER TANKS, Fixtures, Automatic Stand-Pipes, Steam Pumps, Boilers, Valves, Pipe and everything appertaining to Water Supply for Railroad Stations, Roundhouses and Stock Yards.

Plants completely installed or materials and plans furnished.



BARRETT JACKS in variety of patterns for Track, Bridge, Oil Box, Car Raising, Wrecking and other service. Formally adopted as Standard by the Roadmasters' Association of America, in late session at Minneapolis. Other Jacks have merit; none but the Barrett combines desirable features.

FAIRBANKS, MORSE & CO.,
CHICAGO.

WRECKING FROGS, Track Tools, Scrapers, Dump Cars, Carts and other earth-moving implements; Push Cars, Raillayers' Cars; Single, Duplex and Compound Pumps, Windmills and Force Pumps, Engines and Boilers.

Request Catalogue of Above and Kindred Supplies for Railroad Purposes.

CHICAGO SPLICE BAR MILL.

New England Agents,
SHERBURNE & CO.,
No. 53 Oliver St., Boston.

Morris Sellers & Co.,

OFFICE,
216 Phenix Building,
CHICAGO.

MANUFACTURERS OF THE

New "GREER" Railroad Track Spike and the Celebrated "SAMSON" Bar.

Fourteen years' unexampled success has demonstrated the fact that under all varieties of Railroad Service they will prevent "low joints," battered rail ends, and in a remarkable degree withstand the test of breakage. More than 10,000,000 Bars in use on 160 different Railroads, equivalent to 14,240 miles of track.

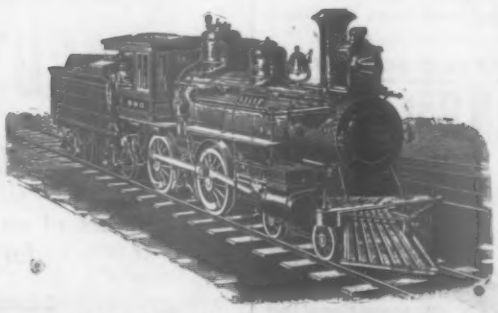
The "Greer" Railroad Track Spike is the latest and best spike offered to the Railroad managements of this country and Great Britain. Indestructible. A holding power of from one to two tons more per spike than any 5½ × 9-16 spike. Automatically sharpened to chisel edge, it cuts; does not tear the wood fiber. Hand packed in kegs—every spike perfect. Particularly adapted for use on Bridges, Trestles, Frogs, Crossings and Switches. SEND FOR TESTS AND PHOTOGRAPHS.

THE FIELD FEED-WATER PURIFIER.

This device will not successfully handle **all waters,** but there are **none** that it will not improve. In a **large majority** it will demonstrate great economy.

The apparatus can be made at railroad shops at small expense.

A trial is solicited at our expense.



Cut showing Purifier Applied to Locomotive.

This water purifier is now in use and on trial on the following railroads:

Wisconsin Central.
Great Northern.
Northern Pacific.
Atchison, Topeka & Santa Fe.
Baltimore & Ohio.

We refer to each of them.

Office: 134 Van Buren Street. CHICAGO, ILL. **Factory: 43d St. & Stewart Ave.**

THE HINCKLEY AUTOMATIC BRAKE-SLACK ADJUSTER

Simple. Compact. Effective.

Piston of Air Brake Cylinder is automatically kept at any desired uniform stroke, resulting in full, effective piston pressure at all times.

ONE ADJUSTER PER CAR.

Uniformly applicable to any form of brake rigging, Passenger or Freight, whether brakebeams are outside or inside hung, etc., etc.

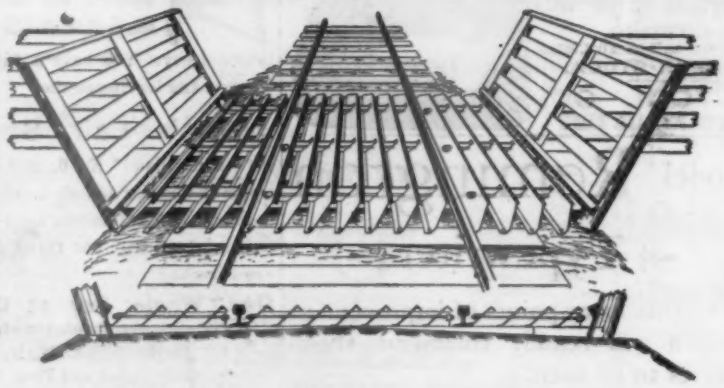
Illustrated Catalogue, with records of performance in service, upon application.

THE HINCKLEY BRAKE COMPANY, TRENTON, NEW JERSEY.

THE "STANDARD" CATTLE GUARD

LEADS ALL GUARDS IN EFFECTIVENESS

Strong, Effective, Cheap. Light, Easily Adjusted, Safe.



AS A RESULT OF RECENT TESTS.

Cost $25.00 F. O. B. Chicago. Weighs Less than 400 lbs.

THIS GUARD WORKS ON AN ENTIRELY NEW PRINCIPLE.

Is Manufactured of Steel Under Original Patents. Guards Against HOGS and SHEEP as Well as Large Stock.

THIS GUARD HAS BEEN PURCHASED BY:
The Pennsylvania,
Chicago & Grand Trunk,
Ohio & Mississippi,
Chicago, Burlington & Quincy,
B. & O. Southwestern,
East Tennessee, Virginia & Georgia

And Others, Although It Has Only Been on the Market TWO MONTHS.

39-43 WEST WASHINGTON STREET, - - - CHICAGO, ILL.

STEEL SURFACE CATTLE GUARDS

—MANUFACTURED BY—

BUSH CATTLE GUARD Co.
KALAMAZOO, MICH.
THE COMMON SENSE STEEL CATTLE GUARD
THE BEST AND CHEAPEST GUARD IN THE MARKET
ALL STEEL
NOT A NUT, BOLT OR RIVET USED
OVER 3000 PLACED
PATENTED JULY 15, 1890.

For Testimonials, Prices, Etc., Address

BUSH CATTLE GUARD CO., Kalamazoo, Mich.

HOISTING ENGINES.

Of any Power and Style, SINGLE AND DOUBLE CYLINDER, with improved patent friction drums especially adapted for all classes of work. Single and Double Drum, friction and direct geared, link motion MINING Engines, Four, six and eight spool, lock clutch, self propeling BRIDGE ERECTING Engines, Double cylinder, double friction drum DOCK BUILDING and PILE DRIVING Engines, Quick motion, friction geared COAL HOISTING Engines, Powerful compound geared and friction geared QUARRY Engines, WITH OR WITHOUT BOILERS. Any amount of reference given. Established 1870.

J. S. MUNDY, 20-34 Prospect St. Newark N. J.

LINK BELT MACHINERY CO.

CHICAGO, ILL.,

MANUFACTURERS OF IMPROVED

FREIGHT AND COAL HANDLING MACHINERY.

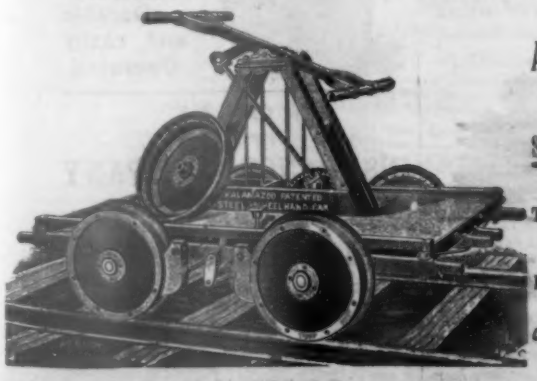
Kalamazoo Railroad Velocipede & Car Co.,

KALAMAZOO, MICH., U. S. A.,

MANUFACTURERS OF

Different Styles of Steel Velocipedes.
Steel-Wheeled Hand Cars.
Rail or Construction Cars.
Hand and Steam Inspection Cars.

Iron and Steel-Wheeled Push Cars.
Pit or Mining Cars.
Sugar-cane Cars.
Steel Surface Cattle Guards.



OUR NEW

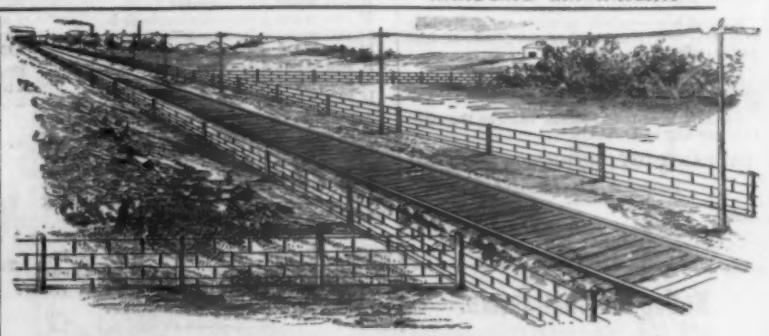
All Steel Hand Car Wheel

Stands 20 Tons Pressure

BEARING ON HUB.

Turned Over Flange Steel Tires, Rolled, Perfectly Smooth and Cylindrical.

CONFORMS TO M. C. B. STANDARD.



We use the "Duncan" Steel Stay-Guard and the "Australian" Stretcher-Fastener.

Barkley & House, Contractors and Builders of all kinds of RAILWAY FENCES, TELEGRAPH and TELEPHONE LINES.

1159 The Rookery, CHICAGO.

GRAPHITE PAINT.

For Tin or, Shingle Roofs and Iron Work.

It Is Absolutely Without an Equal. A tin roof well painted will not need repainting for 10 to 15 years. If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

Spring Edge Seat.

THE LEADING CAR SEAT OF THE TIMES.

The following Popular Trains are furnished in whole or in part with our Superb Seating:

"Gilt Edge Limited."
"Colonial Express" (Royal White Line).
"Empire State Express."
"Fast Flying Virginian."
"Royal Blue Line."
"Diamond Special."
"Red Express."
"Royal Reading Route."

SPECIFY ONLY

"H. & K." SEATS.

"Flying Statesman."
"New York and Chicago Limited."
"Chicago and St. Paul Limited."
"New Orleans and Chicago Limited."
"Columbian Limited."
"Chicago and Nashville Limited."
"Golden Gate Special."
"Washington and Southwestern Limited."

Head Rest Seat.

THE HALE & KILBURN MFG. CO., PHILADELPHIA, NEW YORK, CHICAGO.

THE SANITARY DISTRICT OF CHICAGO.

TO CONTRACTORS.

Sealed proposals addressed to the Board of Trustees of the Sanitary District of Chicago and indorsed:

PROPOSALS FOR EXCAVATING THE MAIN DRAINAGE CHANNEL will be received by the clerk of the said Sanitary District at Room H Rialto Building, Chicago, Ill., until 12 m. (standard time) of Wednesday, the 8th day of June, 1892, and will be publicly opened by the said Board of Trustees at the regular meeting held that day, or at a special meeting called for that purpose.

The work for which the said tenders are invited is the excavation of the main drainage channel for the said Sanitary District between Willow Springs and Joliet, Ill., and consists in all of about 11,500,000 cubic yards of rock, of about 5,000,000 cubic yards of earth, the building of 287,241 cubic yards of dry rubble walls, and 244,444 square yards of slope paving.

Bids will be received on three different propositions, designated as "Proposition 1," "Proposition 2," and "Proposition 3," respectively.

As provided under the different propositions said work will be divided into 14 to 17 sections, each of which will be treated as a separate contract in canvassing the proposals and making awards, except as otherwise provided in Proposition 3. As all awards will be made by individual sections or a group of sections, as provided in the specifications and forms of proposals to be furnished bidders, each bidder must make prices for each section, or a group of sections, as the case may be, separate and distinct from every other. The lumping of prices in any bid other than as given in the form of proposal under Proposition 3 will render such bid informal and will cause its rejection by the said Board of Trustees.

As the question of which proposition will be acted upon will not be determined by the Board of Trustees until after the time set for receiving proposals the bidder is allowed to make three alternative tenders based upon the terms of the specification for each of the three propositions respectively.

Each proposal must be accompanied by a certified check or cash to an amount equal to $3,000 multiplied by the number of sections bid upon, whether said sections stand singly or in a group. Provided, that the said check or cash shall entitle the bidder to make tender under any or all three of the said propositions.

All certified checks must be drawn on some responsible bank doing business in the city of Chicago and be made payable to the order of the Clerk of the Sanitary District of Chicago. Said amount of $3,000 for each section will be held by the Sanitary District until all of said proposals have been canvassed and contracts awarded and signed, the return of said check or cash being conditioned upon any bidder to whom an award of any portion of said work may be made appearing within 10 days after notice of such award being given, with bondsmen, and executing a contract with the Sanitary District for the section or sections of said work so awarded, and giving a bond satisfactory to the said Board of Trustees for the fulfillment of the same in the amount of $100,000 oreach section of work awarded him, whether said sections be awarded singly or in a group.

All proposals must be made on blank forms furnished by the Sanitary District and must give the price for each separate item of work. A form will be furnished for each of the three propositions.

The bids will be compared on the basis of the engineer's approximate estimate of quantities, which will be furnished with copies of the specifications.

No proposal will be considered unless the party making it shall furnish evidence satisfactory to the Board of Trustees of his ability to do the work, and that he has the necessary pecuniary resources to fulfill the conditions of the contract, provided such contract shall be awarded him.

Bidders are required to state in their proposals their individual names and places of residence in full.

Specifications may be had and plans may be seen at the office of the Chief Engineer, Room E Rialto Building, Chicago, Ill.

The said Board of Trustees reserve the right to reject any and all bids.

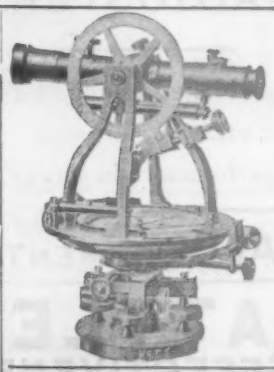
THE SANITARY DISTRICT OF CHICAGO,
By FRANK WENTER,
President of Its Board of Trustees.

Attest:
THOMAS F. JUDGE, Clerk.
Chicago, Ill., April 7, 1892.

Notice to Contractors.

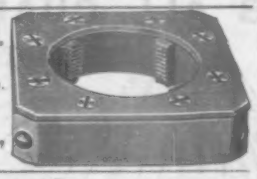
Complete plans, profiles and specifications of The Sanitary District of Chicago, Ill., Main Drainage Channel can be seen at the office of the INGERSOLL-SERGEANT DRILL CO., 10 Park Place, New York.

THE LEHIGH VALLEY
CREOSOTING WORKS
Works, Perth Amboy, N. J.
Office Washington St., So. of Gap, Jersey City, N. J.
H STANLEY GOODWIN, Pres. WALTER G. BERG, Engr.
H. COMER, Supt.
Lumber, Piling and Ties creosoted with DEAD OIL OF COAL TAR. Creosoted timber furnished. Capacity, 400,000 ft. B. M. per month. Cylinders 80 ft. long. Direct water and rail communication.



KEUFFEL & ESSER CO.
LATEST AND MOST IMPROVED
TRANSITS, all kinds,
LEVELS, and other
FIELD INSTRUMENTS
—FOR—
ENGINEERS AND SURVEYORS.
Office Drawing Materials in large variety.
CATALOGUE ON APPLICATION.
265 State St., CHICAGO. 127 Fulton St., NEW YORK.

Hayes Adjustable Pipe Die.
EASY CUTTING,
CAN BE SHARPENED. CAN BE ADJUSTED.
FITS COMMON STOCK.
HAYES TOOL CO.,
41 and 43 CROSS ST., PORTLAND, MAINE.



The 1892 Model **Remington**
Typewriter

Presents many points of improvement which will readily commend themselves to all users.
SEND FOR CATALOGUE.
WYCKOFF, SEAMANS & BENEDICT, 327 Broadway, N. Y.

We are making a Specialty
of the Preparation, Design and Printing of
Fine Trade Catalogues.
Samples and Estimates upon Application.
H. B. Prindle & Co.
522 Exchange Building, Boston, Mass

EMPLOYMENT.

If you want a Chief Engineer!
If you want to make up a Survey Party!
If you want an Engineer on Construction!
If you want to fill a vacancy in Maintenance of Way Department!
If you want an Engineer for Special Service!
If you want a Transitman!
If you want a Leveler!
If you want a Topographer!
If you want a Calculator!
If you want a Superintendent!
If you want a Roadmaster!
If you want a Tunnel Boss!
If you want a Draftsman!
If you want a Contractor!
If you want a SITUATION!

Advertise in the "Wants" columns of ENGINEERING NEWS AND AMERICAN RAILWAY JOURNAL and save Time, Trouble and Expense. There is but one best method of doing anything, and this is the "Best Method" of accomplishing the above.

Cards of one-half inch will be inserted one time for 50 cts., or three times for $1.00. Paper sent at request only, 15 cts. additional.

Copy should reach us not later than Tuesday to insure insertion in issue of same week.

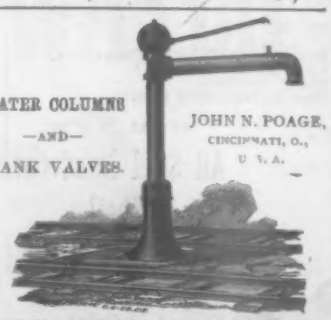
ENGINEERING NEWS PUBLISHING CO.,
TRIBUNE BUILDING, NEW YORK.

ESTABLISHED 1830.
PATENT TRANSITS
YOUNG & SONS,
Engineering Instrument Makers,
43 NORTH SEVENTH STREET,
Philadelphia.
Tapes, Chains, Draughting Instruments. Catalogues on application.

EARLY CLOSING O SATURDAY.

Most of the wholesale and retail firms in Chicago have decided to close their stores on Saturday at 1.00 P. M., commencing May 1st, in order to give their Clerks a much needed rest. In connection with this service the Wisconsin Central lines beg to announce that commencing May 1st, Excursion Tickets will be placed on sale to Lake Villa, Fox Lake, Antioch and Mukwonago. Trains leave the Grand Central Passenger Station at 8.00 A. M., 3.00 P. M., 4.25 P. M., 5.47 P. M. and 10.45 P. M. Returning trains arrive at Chicago at 7.15 A. M., 9.45 A. M., 9.50 A. M., 1.55 P. M., and 7.45 P. M.

Ticket Office, 205 Clark St. Chicago, Ill.



WATER COLUMNS —AND— TANK VALVES.
JOHN N. POAGE, CINCINNATI, O., U. S. A.

THE
RAILROAD GAZETTE
has more Railroad Officers as subscribers and readers than all other railroad papers combined. Its advertising rates are no higher than those of papers having less than half its circulation.

BUSY MEN

will travel via the route that gives them the best service. What can equal the splendid time made by the Chicago, Rock Island & Pacific Ry. in a trip from Chicago to Denver. Just think! You can leave Chicago on the Great Rock Island Route, Big 5, at 10 p. m., and arrive at Denver at 7:40 a. m., second morning. This takes you away from business but one day to make this eleven hundred mile journey. You have a full day in Denver, and leaving on the

World's Fair Special,

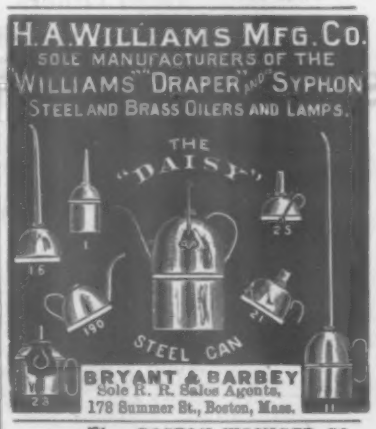
the "Rock Island" No. 6, at 8.10 p. m., arrive at Chicago at 7:45 a. m., second morning. This takes you from business for the whole trip but three days, and you have had

One Whole Day at Denver.

Remember this when figuring on a trip West

JOHN SEBASTIAN,
Gen. Ticket and Pass. Agt.,
Chicago, Ill.

H. A. WILLIAMS MFG. CO.
SOLE MANUFACTURERS OF THE
WILLIAMS "DRAPER" AND SYPHON
STEEL AND BRASS OILERS AND LAMPS.



BRYANT & BARBEY
Sole R. R. Sales Agents,
178 Summer St., Boston, Mass.

BOSTON WRINGER CO.
MANUFACTURERS,
Office: R. 18, 299 Devonshire St.
BOSTON MASS.
BRYANT & BARBEY,
RAILROAD SALES AGENTS,
178 SUMMER ST.
BOSTON, MASS.

Hottest water and strongest lyes can be used, as hands never touch the mop.

Light, Durable and easily Operated.

ROYAL
(FIRE)
INSURANCE COMPANY
Of Liverpool, England.
ESTABLISHED 1845.
HEAD OFFICE METROPOLITAN DISTRICT,
No. 50 Wall St., New York.
TRUSTEES:
JACOB D. VERMILYE. HENRY PARISH
OSGOOD WELSH.
E. F. BEDDALL, Manager.
W. W. HENSHAW, Asst. Manager

RAILROAD GAZETTE

Published Every Friday at
73 Broadway, N. Y.

$4.20 PER YEAR TO UNITED STATES AND CANADA.
6.05 " " " FOREIGN COUNTRIES.

Express money orders, or drafts, or P.O. orders or registered letters should be made to the order of the RAILROAD GAZETTE.

EMPLOYMENT.

WANTED—SEVERAL MORE EXperienced mechanical draftsmen. Also Bridge and Architectural Draftsmen. ENGINEERING EMPLOYMENT BUREAU, 8 Granger Blk., Syracuse, N. Y.

A CIVIL ENGINEER, WITH EXperience on location, construction and maintenance of railroads and on harbor works, desires a position. Steady; speaks and writes Spanish; good references. Address "L. J.," care *Railroad Gazette*.

WANTED—SITUATION BY A practical machinist and college graduate, who has had eighteen years' experience as foreman and draftsman on locomotive and car work. References. Address "MECHANICAL ENGINEER," care *Railroad Gazette*.

WANTED—A MECHANICAL draftsman with technical education and shop experience, for principal in motive power drafting room of a Western railroad. Address, stating age, education, experience, reference and salary expected, "Chicago," care *Railroad Gazette*.

WANTED AND FOR SALE.

FOR SALE.

We own and offer for sale 800 tons of selected second-hand 52-lb. steel rails for prompt shipment. Rails can be inspected at Pittsburgh. Price quoted on application to

ROBINSON & ORR,
Fidelity Building, Pittsburgh, Pa

FOR SALE—A LIGHT STANDARD gauge Engine, in prime condition, made by H. K. Porter & Co., and suitable for logging, switching, manufacturers' yards or short railways. Address W. F. STARK, Supt. Home Ave. R. R., Dayton, Ohio.

WANTED — 800 TONS 35-LB. T Steel Rails and Fastenings. Payment in 5 per cent. 30-year gold bonds of completed road, or on six-month bonds as collateral. Box 300, De Witt, Ark.

LOCOMOTIVES, BOILERS, RAILS, CARS, STRUCTURAL MATERIAL, BRIDGES
INSPECTION
R. W. HILDRETH & Co
2 WALL ST NEW YORK.

HAVE YOU A POSITION TO FILL?

NOTIFY THE
Engineering Employment Bureau,
8 GRANGER BLOCK, SYRACUSE, N. Y.
Civil, Mechanical and Mining Engineers, Instrument Men, Draftsmen and Chemists.
NO CHARGE TO EMPLOYERS.

SECOND HAND STEEL RAILS.

1,000 tons 60-lb. section, fit for relaying. Also Old Rails for Builders' and Contractors' use, in quantities to suit. For sale by

WM. H. PERRY & CO.,
PROVIDENCE, R. I.

TEE AND STREET RAILS, SPLICE BARS, TRACK BOLTS AND NUTS, R. R. SPIKES.
FROGS, CROSSINGS, SWITCHES AND FIXTURES.
IRON AND STEEL AXLES, CAR TRUCK CHANNELS, WROUGHT IRON TURNBUCKLES, LINKS AND PINS AND CAR COUPLERS.
BAR IRON AND STEEL, SHEET IRON AND STEEL, CORRUGATED IRON.
STEAM SHOVELS, BALLAST UNLOADERS, AND STEAM CRANES.
LOCOMOTIVES AND CARS OF ALL KINDS.
BEAMS, CHANNELS, ANGLES TEES AND ODD SECTIONS.

A. T. SHOEMAKER,
Railroad Supplies and Equipment.
(*New and Second Hand.*)
146 BROADWAY,
NEW YORK.

VAILE & YOUNG'S
Patent Metallic Skylights.

HALF SIZE.

Without Putty.
Construction adapted to all forms and styles of Skylights. Thousands of feet in use have proved its superiority. Particularly adapted for Depots, Mills, Factories, etc., where large and continuous lights are required. Send for illustrated Catalogue.

216 N. Calvert St., Baltimore, Md.

FOR SALE.

For immediate delivery, a number of
Standard Gauge Locomotives,
Now in use on the Northern Pacific Railroad.
Cylinders { 15 × 22 inches, 15 × 24 inches. / 16 × 22 inches, 16 × 24 inches.
Weight, 59,000 to 72,000 pounds.

Two Narrow Gauge, 6-wheel Locomotives,
Cylinders, 12 × 18 and 12 × 24 inches.
Weight, 48,000 to 74,000 pounds.

Also Saddle Tank Engines,
Cylinders, 10×14 inches. Weight, 26,000 pounds.

Several Forney Type Engines,
Cylinders, 10 × 14 inches.
Weight, 33,000 to 36,000 pounds.
For New York Delivery.

Steel Rails, Fastenings and All Classes of New and Second-hand Equipment.

FULL DESCRIPTION ON APPLICATION.

GEO. A. EVANS, 18 Wall St., New York

WANTED.

One copy of the *Railroad Gazette* of Oct. 3, 1890. Address the *Railroad Gazette*, 73 Broadway, New York.

FOR SALE—ONE LIDGERWOOD double 8¼ × 10 double drum; one Lidgerwood double 7 × 10 double drum; one Lidgerwood double 6¼ × 8 single drum; one Mundy double 6½ × 12 double drum; one Mundy double 7 × 12 single drum; three pile drivers and hammers, three steam dredges, three steam shovels, 3 ft. locomotive cars, rails, contractor's tools, Carson trench digger, derricks, scows, two and four million gallon pumps, boilers, rollers, tanks, all sizes; road scrapers, 4 and 10-in. pipe, compressors, crushers; engines, all sizes. W. S. MIDDLETON, 52 John street, New York.

FOR SALE.

One combination passenger and baggage car and two passenger coaches—standard gauge; equipped with Westinghouse brakes; nearly new; immediate delivery.

Two open excursion cars, seating 85, for sale at a bargain.

HUMPHREYS & SAYCE,
10 WALL ST., NEW YORK.

BOILER MAKERS' TOOLS
FOR SALE.

One 20-in. Hydraulic Riveting Machine, with wrought iron stake, 70 tons pressure on the rivet, with pressure Pump and Accumulator.

One 10-ton Traveling Crane, Bridge 24 ft. between centre of rails by 20 ft., all movements by power, two speeds, 3 and 8 ft. per minute, controlled by four levers placed alongside Riveting Machine.

One Power Punching Machine, will punch 1¼ in. in 1 in. iron, 30 in. from edge of plate.

One Power Shearing Machine from same patterns, with same strength as the Punch.

One Plate Planing Machine, to plane 16 ft. long, without shifting, provided with special table to receive firebox fronts, overhanging housings, clamping bar raised and lowered by connected screw, vertical, horizontal and angular feeds, planes ¾ in. steel plate.

One Set Bending Rolls, 8 ft. between housings, two lower rolls 10 in. diameter, upper roll 11 in. diameter, so constructed that circular form can be withdrawn without removing the top roll.

The above were built by Bement, Miles & Co., Philadelphia, Pa. Are entirely new, will be sold separately or together. Immediate delivery.

GEORGE PLACE MACHINE CO.,
190 Broadway, New York.

VON SCHON & GARNER, Civil Engineers
FREDERICKSBURG, VA.
Examination of railroad projects and property; surveys and locations of railroads. We operate throughout the South. Estimates free.

J. A. L. WADDELL
Consulting Bridge Engineer,
KEITH AND PERRY BUILDING,
KANSAS CITY, MO.
Superstructure. Substructure.
Engineer in charge of Western Office of the Phœnix Bridge Co. Special attention paid to deep borings to and into bed rock.

C. BOUSCAREN, Consulting Engineer,
MITCHELL BUILDING, CINCINNATI, O.
Surveys, Construction and Inspection of Railways, Long Span Bridges and Roofs. Structural Works of Iron and Steel, Water works, Irrigation, Drainage and Sewerage Systems.

THOMAS APPLETON,
M. A. S. C. E.,
Civil Engineer and Architect,
General Engineering and Architectural Work.
SPECIALTIES: Railway Terminals, Switching Yards, Passenger Stations, Freight Depots, Coal and Ore Docks, Round Houses, Machine Shops, Foundries, etc.
505 RIALTO BUILDING, CHICAGO, ILL.

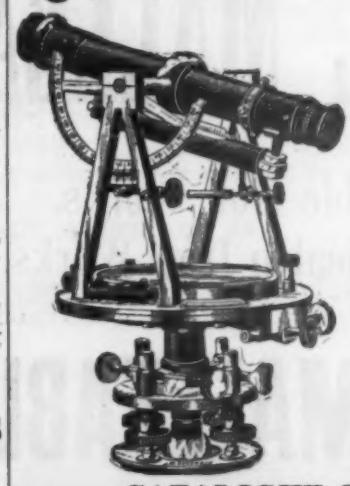
Member Am. Soc. Civil Engineers.
Member Am. Inst. Mining Engineers.
Associate Am. Inst. Electrical Engineers.
FREDERICK H. SMITH,
Consulting Engineer & Geologist, Bridge Engineer
227 E. German St., Baltimore, Md.

GEO. L. FOWLER,
Mechanical Engineer,
53 Broadway, New York.
Special attention given to Designing, Testing and Constructing Railroad Machinery and Rolling Stock.
Sole Agent for Johnson's Portable Swits

J. JAMES R. CROES,
M. Am. Soc. C. E.; M. Inst. C. E.,
13 William Street, New York City,
CONSULTING ENGINEER.
Examinations and Reports made on Projects for Water Supply and Sewerage of Towns, Rapid Transit and River Improvements.
Plans and Specifications prepared and Work of Construction superintended.

CONTRACTS WHERE TO FIND THEM.
See Engineering News, N.Y. City
Single Copies. 15 cents. All Newsdealers.

QUEEN & CO., PHILADELPHIA,



MANUFACTURERS OF
Engineers', Surveyors' and Draughtsmen's Supplies.

Improved Complete Engineers' Transit.

Power of telescope, 21 diam. Compound long centers. Two outside verniers. Five-in. needle. Level to telescope, vertical arc, clamp and tangent and the usual accessories. Complete with box and tripod. PRICE, $180.

ENGINEERS' PLAIN TRANSIT.

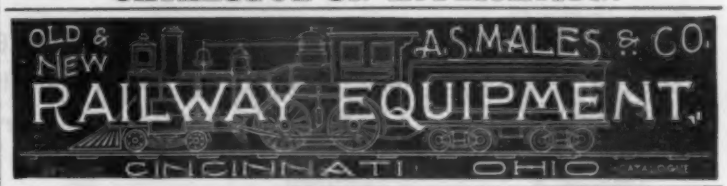
Same as above, without level, arc or clamp and tangent. PRICE, $150.

Improved Engineers' Wye Level.

Telescope, 18 or 20 in. Power, 40 or 50 diameters, as desired. Shifting center. Complete with box and tripod and usual accessories. PRICE, $110.

Any of these instruments sent on approval, with privilege to return if not satisfactory.

CATALOGUE ON APPLICATION.



L. BRECKINRIDGE CABELL,
—DEALER IN—
Lands, Securities and Industrial Enterprises.
Total Issues of Corporate, Municipal and County Bonds Taken.
RAILROADS BUILT AND EQUIPPED.
53 Broadway, Room 17, - - - - NEW YORK.

Flood & Conklin Co.
VARNISH MAKERS,
NEWARK, N. J.

Railway Varnishes and Surfacers
A SPECIALTY.

CHARLES S. HELLER (ESTABLISHED 1870.)

TRADING AS
HELLER & BRIGHTLY,
MANUFACTURERS OF
ENGINEERING, MINING AND SURVEYING
INSTRUMENTS,
Cor. SPRING GARDEN STREET and RIDGE AVENUE,
PHILADELPHIA, PA.

CHARLES H. BRIGHTLY.
TRADE MARK.

Late of HELLER & BRIGHTLY,
MANUFACTURER OF
Mathematical, Engineering and Surveying
INSTRUMENTS.
Germantown Junction, P. R. R. 16th St. Station, P. & R. P. P.,
PHILADELPHIA, PA.

D. L. BARNES,
Mechanical and Consulting Engineer.
SPECIALTY: RAILWAY and LOCOMOTIVE WORK.
Marine and land engine tests made at short notice. Recent and scientific methods used in all work.
The completion of inventions to practical application, including specifications and estimates, forwarded by new methods.
73 BROADWAY, NEW YORK,
AND
Rookery Building, Chicago, Ill.

Charles Paine & Sons
Consulting and Civil Engineers,
71 Broadway, New York City.

Rail Roads

Preliminary Surveys,
Location,
Construction,
Equipment,
Water Supply,
Terminal Yards
Signals,
Electric Appliances.
Improvement of Villages and Estates.

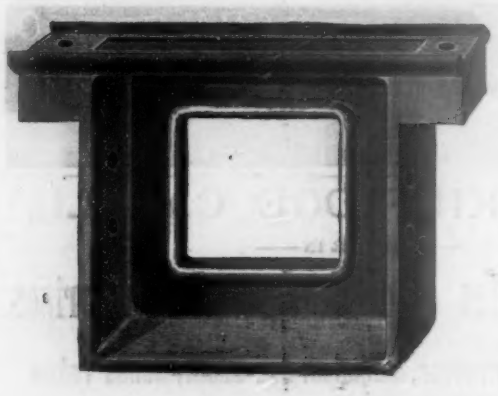
THE NATIONAL MALLEABLE CASTINGS CO.

—OPERATING THE—

Cleveland Malleable Iron Works.
Chicago Malleable Iron Works.
Indianapolis Malleable Iron Works.
Toledo Malleable Iron Works.

—MANUFACTURERS OF—

REFINED MALLEABLE IRON CASTINGS.



Draw Bars, Center Plates, Side Bearings, Truck Ends Chafing Plates, Swing Hanger Bearings and Pivots, Dead Blocks, Draw Bar Stops, Brake Hangers, Door Fasteners and many other articles used in Car Construction and Repairs.

Head Chairs, Step Chairs, Slide Switch Plates, Rail Braces, Switch Nibs, and other Castings used in Maintenance of Way. Shop, Engine and Track Wrenches. Other Castings made to order.

Our Largely Increased Facilities Justify Us in Soliciting Your Patronage

Address the NATIONAL MALLEABLE CASTINGS CO. at either of the four points named above.

GEO. A. BOYDEN, President. WM. WHITRIDGE, Treasurer. CHAS. B. MANN, Secretary.

THE BOYDEN BRAKE COMPANY,

BALTIMORE, MD., U. S. A.

MANUFACTURERS OF

AUTOMATIC QUICK-ACTION AIR BRAKES

FOR PASSENGER CARS, FREIGHT CARS AND TENDERS.

ALSO DRIVER BRAKES AND AIR EQUIPMENT FOR ENGINES.

The Entire Brake and Signal Apparatus Is Interchangeable with the Westinghouse

OUR APPARATUS IS IN SUCCESSFUL OPERATION ON 45 ROADS.

IT PAYS FOR ITSELF.

Individual Continuous-Ringing Telegraph Call

—WITH—

AUTOMATIC ANSWER BACK.

MODEL OF 1892.

ELECTRIC SECRET SERVICE COMPANY,

45 BROADWAY, NEW YORK.

C. P. MACKIE, Gen. Man. S. S. BOGART, Gen. Agent. J. W. LATTIG, Gen. Supt.

THE CURTIS STEAM PRESSURE REGULATOR.

THE CURTIS REGULATORS

CHEAPEST, MOST DURABLE,

MOST POWERFUL. HAVE STOOD THE TEST OF EIGHT YEARS.

OUR PATENTS:—Damper Regulators, Pressure Regulators for Steam and Water; Return Traps, Separators, Balanced Steam Traps, Damper Regulators for Hot Water Heating; other Steam Specialties.

FULL INFORMATION CHEERFULLY FURNISHED BY

GENERAL AGENCIES:

NEW YORK, 109 Liberty Street.
PHILADELPHIA, 2035 N. Front Street.
CHICAGO, 218 Lake Street.
DENVER, 16th and Arrapahoe Sts.

The CURTIS REGULATOR CO.

63 BEVERLY ST., BOSTON, MASS.

Important to Railroad Managers and Master Mechanics.

SIBLEY'S

PERFECTION VALVE OIL.

More perfect lubrication insured, and entire freedom guaranteed from corrosion of cylinders and destruction of steam joints by fatty acids.

In exclusive use on 50 railroads.

References and prices furnished upon application.

☞ Make exclusive specialty of the Manufacture of Valve and Signal Oil for Railroad use.

SIGNAL OIL WORKS
(Limited),
FRANKLIN, PA.
J. C. SIBLEY,
PRESIDENT.

PAUL S. REEVES,
PHILADELPHIA,

PHOSPHOR BRONZE
IN INGOTS AND CASTINGS.

LEAD LINED CAR BEARINGS
A SPECIALTY.

Brass and Phos. Bronze Castings from ¼ lb. to 5,000 lbs. in Weight.

All GENUINE INGOTS & MANUFACTURES BEAR OUR REG. TRADE MARKS.
"Phosphor-Bronze"

PHOSPHOR-BRONZE
INGOTS, CASTINGS, WIRE, SHEET &c.
THE PHOSPHOR BRONZE SMELTING CO. LIMITED
512 ARCH ST. PHILADELPHIA PA. U.S.A.
ORIGINAL MANUFACTURERS OF PHOSPHOR-BRONZE IN THE UNITED STATES AND SOLE MAKERS OF "ELEPHANT BRAND" PHOSPHOR-BRONZE.

PHILADELPHIA CORLISS ENGINES

NON CONDENSING
CONDENSING
TRIPLE & QUADRUPLE EXPANSION
HORIZONTAL OR VERTICAL
SUPERIOR DESIGN WORKMANSHIP & FINISH

PHILADELPHIA ENGINEERING WORKS LTD.
MIFFLIN STREET
EAST OF FRONT ST.
PHILADELPHIA, PA.

CATALOGUES MAILED ON APPLICATION.

W. W. LINDSAY, MANAGER WESTERN BRANCH, PHOENIX BUILDING, CHICAGO, ILL.

THE IMPROVED FISHKILL CORLISS ENGINE

BUILT BY THE FISHKILL LANDING MACHINE CO.
FISHKILL ON HUDSON
N.Y.

High Economy, Noiseless Operation. Close Regulation.

Fire-Proof Baker Car Heater.

MANUFACTURED ONLY BY

WM. C. BAKER.
799 Greenwich Street,
NEW YORK.

Five Hundred and Fifty Fire-Proofs in Use.

Fire within a Safe like that on the Express Car. Jointless, one-fourth inch thick, Flexible Steel, that may be bent, buckled, but never broken.

Every First-Class Car should have it, where Safety, Comfort and Compactness are considered. In Jay Gould's Private Car, "Atlanta" (Old Style Baker Car Heater, and "Double-Coil," Steam Attachment removed); also in Private Car of President Roberts, of the Penn. R. R.; Vice-Pres. McCrea, of the Penn. Co.; Pres. Palmer, of the Rio Grande & Western; Pres. Pelton, of the East Tenn., Va. & Ga. Ry.; Officers' Car, Cleveland, Akron & Columbus R. R.; General Manager McDoel, of the Louisville, New Albany & Chicago; J. V. Patton, Pittsburgh & Western; Payson Tucker, Maine Central; J. B. Haggin's Private Car; Pres. Inman, of Richmond & Danville, and others.

Northern Pacific has 117; Phil. & Reading, 70; Minneapolis, St. Paul & Sault Ste. Marie, 43; Can. Pacific, 48; Great Northern, 15.

Veterans Route to the Encampment.

Veterans going to the G. A. R. Encampment at Washington in September via the B. & O. R. R. will traverse territory fraught with a thousand reminiscences of the conflicts in which they figured so gallantly. Along Cheat River, on the western slope of the Alleghanies, they will pass the scenes of Gen. McClellan's victories over Gen. Floyd in the early stages of the war. At Grafton they will pass near the battlefield of Philippi. At Piedmont they will enter the historic Potomac valley, which was debatable ground all the way to Washington. The towering mountains, which shut in the valley, echoed and re-echoed almost hourly with the roar of cannon and musketry. The mountain tops witnessed the engagement at Martinsburgh, Antietam, Sharpsburgh, South Mountain, Monocacy, Ball's Bluff, Leesburgh, Dranesville, Chantilly, Centreville, and the hundreds of skirmishes along the hillsides and in the valleys. At the foot of the mountains, along the banks of the Potomac, paced the solitary sentry, protecting often the tracks and trains of the B. & O. R. R., which the Government zealously guarded as the great highway of communication between the West and the National Capital, and which is the best known route to the East to thousands of veterans who traveled over it early in the sixties as raw recruits to join the ranks. And the Potomac! What memories its mention awakens! And Harper's Ferry too! There stood John Brown's old fort. There "Stonewall" Jackson performed his great exploits. It was near there that Lee crossed the Potomac into Maryland and then invaded Pennsylvania to meet the repulse at Gettysburg. At Harper's Ferry begins the famous Shenandoah Valley, which is penetrated from end to end by the B. & O. R. R., bringing into easy access the battlefields at Winchester, Kernstown, Opequan, Cedar Creek, Fisher's Hill, Front Royal, New Market, Harrisonburgh, Cross Keys, Port Republic, Waynesboro and McDowell. What memories of heroism, of forced marches, of victories and defeats these names recall! And with them come trooping from the past the names of Sheridan, of Pope, of Banks, of Fremont, of Shields, of "Stonewall" Jackson, of Lee, of Ashby, and of Early.

It is only by the B. & O. R. R. that these famous battlefields can be reached. During the encampment excursions will be run to them daily from Washington at greatly reduced rates. Excursions will also be run to Gettysburg, to Manassas, to Bull Run, to Fredericksburgh and other Virginia battlefields.

Factory:
239 to 251 Washington Ave.,
Allegheny, Pa.

For Passenger Coaches, Parlor and sleeping Cars Used by the leading Railroads and Car-Builders

O. K. GARDNER, Mfr., P. O. Box 171, Pittsburgh, Pa

DEER PARK AND OAKLAND.

To those contemplating during the coming summer a trip to the mountains in search of health or pleasure, Deer Park, on the dome of the Alleghany Mountains, 3,000 feet above the sea level, offers such varied attractions as a delightful atmosphere during both day and night, pure water, smooth, winding roads through the mountains and valleys, and the most picturesque scenery in the Alleghany range. The hotel is equipped with such adjuncts conducive to the entertainment, pleasure and comfort of its guests, as Turkish and Russian Baths, swimming pools for both ladies and gentlemen, billiard rooms, superbly furnished parlors, and rooms single or en suite, an unexcelled cuisine and superior service.

The surrounding grounds as well as the hotel are lighted with electricity, have cosy and shady nooks, meandering walks, lawn tennis courts and grassy play grounds for children within full view of the inviting verandas. Six miles distant on the same mountain summit is Oakland, the twin resort of Deer Park, and equally as well equipped for the entertainment and accommodation of its guests. Both hotels are upon the main line of the Baltimore & Ohio Railroad, have the advantage of its splendid Vestibuled Limited Express trains between the East and West, and are, therefore, readily accessible from all parts of the country. Season Excursion tickets, good for return passage until October 31, will be placed on sale at greatly reduced rates at all principal ticket offices throughout the country. One way tickets reading from St. Louis, Louisville, Cincinnati, Columbus, Chicago and any point on B. & O. system to Washington, Baltimore, Philadelphia or New York, or vice versa, are good to stop off at either Deer Park or Oakland, and the time limit will be extended by agents at either resort upon application.

The season at these popular resorts commences June 22.

For full information as to rates, rooms, etc., address George D. De Shields, Manager, Deer Park or Oakland, Garrett County, Maryland.

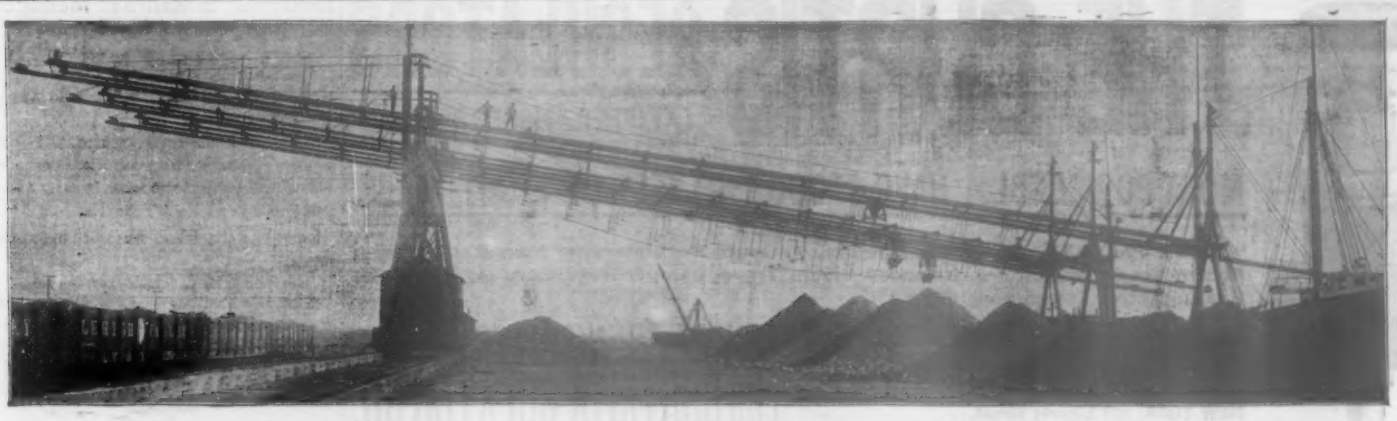
BINDING.

RAILROAD GAZETTE subscribers can exchange complete files for any year for bound volume of the same year on payment of the cost binding, which is $2.

The binding is good.

If files are not complete, the missing numbers can usually be supplied, at this office, at 10 cents each.

Bound volumes are supplied at $6 each. Address *The Railroad Gazette*, 73 Broadway, NY.



The Brown Patent Bridge Tramway Hoisting and Conveying Apparatus, as Applied to the Lehigh Valley R. R. Co.'s Docks, Buffalo, N. Y.
Clear Span of Bridges, 180 feet. Cantilever Extension, 80 feet. Tramway Projection over Vessel, 36 feet. Height of Bridge at Front, 90 feet. Height of Bridge at Back Pier, 52 feet.

"THE BROWN HOIST"

Unloads and handles **75 PER CENT.** of all iron ore received at the Lake Ports. It is the only system that properly handles coal with minimum breakage. Used by all large Railroad and Dock Companies.

Office and Works: Cor. Hamilton & Belden Streets.

THE BROWN HOISTING & CONVEYING MACHINE CO., Cleveland, O.

THE DE LA VERGNE REFRIGERATING MACHINE COMPANY

Office and Works: Foot of East 138th St. (Port Morris), New York City.

MANUFACTURERS OF

REFRIGERATING AND ICE-MAKING MACHINES

AND OF

ANHYDROUS AMMONIA for the Same.

Abou **400 Machines** now in successful operation, some of them representing the largest machines ever built. **Total Capacity about 20,000 Tons of Ice Per Day.**

Send for either Refrigerating or Ice Making Circulars.

NEW YORK BELTING & PACKING CO

(LIMITED), 15 PARK ROW, NEW YORK.
JOHN H. CHEEVER, Manager.

Oldest and Largest Mfrs. in the U. S. of

VULCANIZED RUBBER FABRICS

For Mechanical Purposes.

RUBBER BELTING AND PACKING.

Westinghouse Air Brake Hose.

RUBBER CEMENT.

FIRE PROOF ROOFING

More durable than tin and less expensive. Requires no skilled labor in laying. Will not run or crack from heat or cold.

TEN YEARS IN USE.

Write for sample and circular.

EASTERN GRANITE ROOFING CO.,
JERSEY CITY, N. J.

DRAKE & WEIRS, Cleveland, Ohio.

ASPHALT CAR ROOFING

The Cheapest, Best and Most Durable Car Roof Known. In use by **Seventy Railroads.** Twelve years successful use without a single failure. A new roof furnished free for every one that fails in ten years.

ROBERTS PATENT
WOVEN WIRE CAR SEATS
RATTAN & PLUSH SEATS
PATENT WOVEN WIRE SEAT & BACK SPRINGS
ADDRESS FOR CATALOGUE ESTIMATES ETC.
THE HARTFORD WOVEN WIRE MATTRESS CO.
P.O. BOX 563 HARTFORD CONN.

HINSON DRAW-BAR ATTACHMENT, 506 The Rookery, Chicago

This Attachment is in Satisfactory Use on a Large Number of Cars and Adopted as Standard by a Number of Companies.

For repairs on old cars we make a pattern with the holes to correspond with the ones now used in such cars, but for new work we prefer to furnish our standard

J. A. HINSON, President. P. M. REAGAN, Secretary.

STREET RAILWAY FEED WIRES AND CABLES

THE BEST IS THE CHEAPEST.

OKONITE TRADE MARK

WE BACK UP OUR GUARANTEES.

FEED WIRES manufactured under the above Trade Mark are THE BEST IN THE MARKET.

WILLARD L. CANDEE, H. DURANT CHEEVER, } Mgrs.
GEO. T. MANSON, Gen'l Supt.

THE OKONITE COMPANY, LIMITED,
13 PARK ROW, NEW YORK.

O'NEIL'S Automatic Highway Crossing Alarm

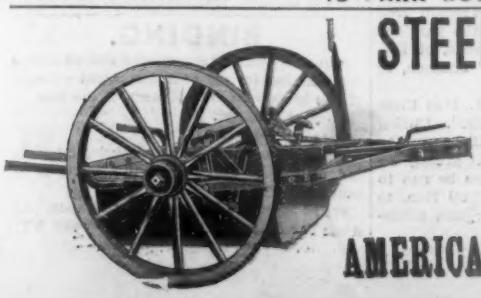
is in use on the New York, Chicago & St. Louis; New York, Lake Erie & Western; New York, Pennsylvania & Ohio; Chicago & Erie; Lake Shore & Michigan Southern; Chicago & Grand Trunk; Flint & Pere Marquette; New York, Susquehanna & Western; Colorado Midland; Toledo, Ann Arbor & North Michigan; Cincinnati, Jackson & Mackinaw; Baltimore & Ohio Southwestern; Pittsburgh & Western; New York & New England; Cincinnati, New Orleans & Texas Pacific, and other railroads.

Suitable for All Locations, Either Double or Single Track.

ELECTRIC SUPPLY & MFG. CO.,
113 Public Square, CLEVELAND, O.

JNO. W. CLARKE, Gen'l Western Agent, 470 The Rookery, Chicago, Ill.

STEEL SCRAPERS, PLOWS AND WHEELBARROWS



OF GREAT STRENGTH AND DURABILITY.

BUILT EXPRESSLY FOR CONTRACTORS.

MANUFACTURED ONLY BY

AMERICAN STEEL SCRAPER CO., SIDNEY, O.

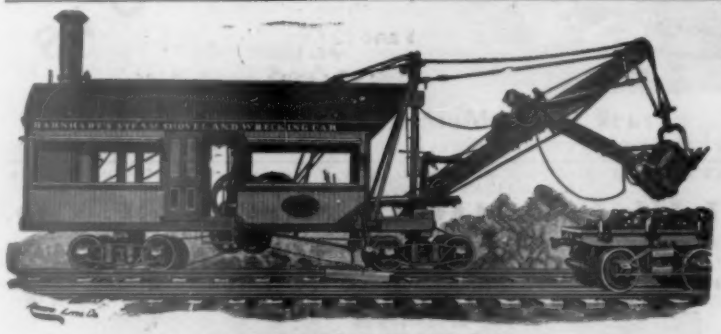
INDUSTRIAL WORKS,

BAY CITY, MICH.

NEW YORK AGENCY
OFFUTT & CO.,
Corner Church and Hector Streets.

CHICAGO AGENCY
L. M. SLACK,
411 Phenix Building.

CRANES, RAIL SAWS,
WRECKING CARS, TURN-TABLES,
STEAM SHOVELS, TRANSFER TABLES,
PILE DRIVERS, FREIGHT CONVEYORS.



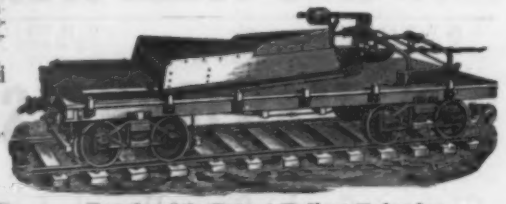
One and One-half Yard Shovel.

MARION STEAM SHOVEL COMPANY

MANUFACTURERS OF
BARNHARDT'S PATENT STEAM SHOVELS, WRECKING CARS AND DREDGES
RAILROAD DITCHERS AND BALLAST UNLOADERS.

All of our machines guaranteed to give entire satisfaction, otherwise may be returned at our expense.
For further information, photographs, catalogues and discounts address

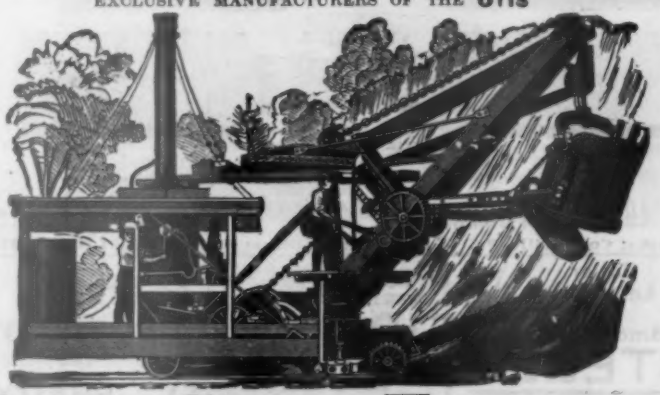
Marion Steam Shovel Co.
595 West Centre Street
MARION, O.
San Francisco Office:
Geo. W. Barnhardt, 4 Sutter St.



Barnhardt's Patent Ballast Unloader.

JOHN SOUTHER & CO., BOSTON, MASS

EXCLUSIVE MANUFACTURERS OF THE OTIS

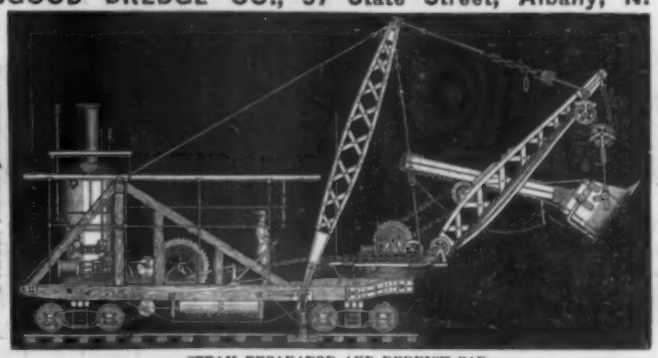


Patent Steam Excavators,

WITH CHAPMAN'S IMPROVEMENTS AND DREDGES.

OSGOOD DREDGE CO., 37 State Street, Albany, N. Y

No. 1.—Weight, 40 tons. Capacity 6 cubic yards per minute.



No. 2.—Weight, 28 tons. Capacity 4 cubic yards per minute.

STEAM EXCAVATOR AND DERRICK CAR

Aside from Our Standards (Nos. 1 and 2) we Build Machines of Special Design, or from any Drawings Furnished.

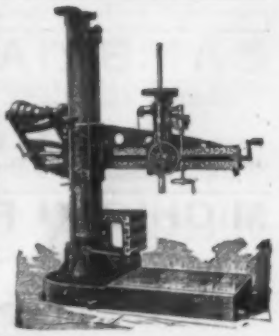
DREDGES & SHOVELS

STEAM DREDGES.
STEAM SHOVELS.
—FOR ALL PURPOSES.—

Bucyrus Steam Shovel & Dredge Co.,
BUCYRUS, OHIO.

THE UNIVERSAL
RADIAL DRILL CO.,
CINCINNATI, O.,
Manufacturers Exclusively of
"Universal" and "Radial"
DRILLING
MACHINES,
to Standard Gauges.

Prices upon application.
Correspondence solicited.



Rock Drilling and Air Compressing MACHINERY

FOR
TUNNELS, QUARRIES, MINES, RAILROADS,
And Wherever Ore and Rock are to be drilled and blasted.

RAND DRILL CO.,
23 Park Place, - - - NEW YORK.

THE NEW HIGH EXPLOSIVE RACKAROCK

Furnished in two ingredients which are absolutely unexplosive until combined by the consumers, for which we furnish convenient means. Shipped and stored as ordinary merchandise. After combination the explosive is absolutely safe. By reason of its safety it is especially adapted to water-works construction in crowded streets.

Rendrock Powder Co.
23 PARK PLACE, NEW YORK

Car Pile Drivers.

SEND FOR CATALOGUE.

VULCAN IRON WORKS,
CHICAGO.

SPECIAL NOTICE.

Two handsome photo-engraved display sheets entitled:
"Recent Improvements in Air Compressors."
"Recent Improvements in Rock Drills."
Mailed free to any one who will cut out this advertisement and mail it to us with his name and address.

The Ingersoll-Sergeant Drill Co.,
No. 10 PARK PLACE, NEW YORK.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

ILLINOIS STEEL COMPANY

Manufacturers of Bessemer, Foundry and Mill Pig Iron, Spiegel and Ferro-Manganese; Iron and Steel Merchant Bar; Nails and Rail Fastenings; Light "T" and Street Rails; Steel Blooms, Slabs, Billets and Wire Rods of any required chemical composition; Iron or Steel Car Truck Channels; Steel "I" Beams and Structural Shapes. Rolls for Standard Sections and Shapes always in stock. Special Sections and Shapes made to order.

BESSEMER STEEL RAILS

FROM 8 TO 100 LBS. PER YARD.

This Company owns and operates five works, namely: NORTH WORKS and UNION WORKS, Chicago; SOUTH WORKS, South Chicago; JOLIET WORKS; MILWAUKEE WORKS.

JULIAN L. YALE, General Sales Agent, General Offices, "Rookery," Chicago, Ill. Milwaukee (Wis.) Office, 151 N. W. Ins. Building. New York Offices, 46 Wall Street. D. E. GARRISON & CO., Agents, St. Louis, Mo.

THE SPRINGFIELD IRON COMPANY,

SPRINGFIELD, ILLINOIS.

CHICAGO OFFICE: 710-711 Phenix Building.

ST. LOUIS OFFICE: 125 and 127 Laclede Building.

IRON AND STEEL SPLICE BARS.

Track Bolts, Merchant Iron and Bar Steel.

The largest capacity and best facilities in the United States for making Angle Splice Bars.

S. T. WELLMAN, President. S. H. CHAUVENET, Vice-President. C. H. WELLMAN, Superintendent. RICHARD PETERS, Jr., Secretary. JOHN P. CROZER, Treasurer.

WELLMAN IRON & STEEL CO.

—MANUFACTURERS OF—

Highest Grade Open Hearth Low Phosphorus

STEEL PLATE

For Fire-Box, Flange and Boiler Purposes.

PLATES UP TO 126 INCHES IN WIDTH.

GENERAL OFFICE AND WORKS, THURLOW, DEL. CO., PA

CHICAGO, ILL.: 656 THE ROOKERY. E. W. CRAMER, Agent.

NEW YORK, N. Y.: 7 NASSAU STREET. J. H. BELCHER, Agent.

Norristown Steel Co.

Norristown, Pa.

Makers of the best quality of OPEN HEARTH STEEL CASTINGS of every variety up to 35 tons in weight, solid, free from blow-holes and equal to the best Steel Forgings. Rolls and all rolling mill castings a specialty. Correspondence Solicited.

CAMBRIA STEEL RAILS.

HEAVY RAILS, LIGHT RAILS AND RAIL FASTENINGS. STEEL CAR AXLES. STEEL CAR CHANNELS.

STREET RAILS.

ADDRESS: CAMBRIA IRON CO., Office, 218 South Fourth St., Philadelphia, Pa. [Works, Johnstown, Pa.] Chicago Office: Phenix Building.

MICHIGAN FORGE & IRON CO.,

No. 1 Newberry Bldg., Detroit, Mich.,

Manufacturers of

MERCHANT BAR IRON.

And all Kinds of

Car and Driving Axles, Links and Pins, Shafting and Forgings.

JAMES McMILLAN, Pres. HUGH McMILLAN Vice-Pres. W. C. McMILLAN, Gen. Man. J. S. BAUGH, Gen. Supt. S. A. BAUGH, Supt. R. D. FIELD, Sec. W. ANDERSON Treas.

UNION IRON WORKS,

SAN FRANCISCO, CAL.

Only Iron and Steel Ship Builders on Pacific Coast.

MINING MACHINERY

A SPECIALTY.

HYDRAULIC LIFT DOCK

CHARLES HUSTON, Prest. A. F. HUSTON, Vice-Prest. C. L. HUSTON, Gen. Man. R. B. HAINES, Jr., Sec'y. JOS. HUMPTON, Treas.

LUKENS IRON & STEEL CO.

ESTABLISHED 1810. INCORPORATED 1890.

The First to Make Boiler Plates in America.

STEEL AND IRON PLATES.

Firebox Steel Plates a Specialty. We Can Roll Steel Circles 116 in. Diameter or Rectangular Plates 114 in. Wide. Range of Thickness, from ⅛ to 1½ in.

Ultimate, 55 000. Elongation, 42%. Elastic Limit, 34,000. Reduction of Area, 58%. Phosphorus, 0.03.

COOLBAUGH & POMEROY, GENERAL RAILWAY AGENTS, 29 Broadway, New York.

Works: Coatesville, Pa. Philadelphia Office: Rooms 62 & 64 Bullitt Bldg.

Boiler, Locomotive AND Smoke Stack STEELS

QUALITY UNSURPASSED.

Plates up to 100 inches in width. All Flange perfectly. Any tensile strength required.

Siemens-Martin OPEN HEARTH FIRE BOX STEEL

Ingots, Slabs and Blooms.

SOFTNESS, DUCTILITY AND PURITY.

SHOENBERGER & CO., PITTSBURGH, PA.

VERONA TOOL WORKS, TRADE MARK. PITTSBURG, PA.

METCALF, PAUL & CO

Make a Specialty of

SOLID STEEL RAILROAD TRACK TOOLS.

ALSO SOLE MANUFACTURERS OF THE PATENT VERONA NUT LOCK

SEND FOR OUR NEW CATALOGUE.

Western Warehouse: 7th Av. & LIBERTY St., PITTSBURGH. 64 & 66 S. CLINTON St., CHICAGO

THE FARIST STEEL COMPANY

JOEL FARIST, Prest. GEO. WINDSOR, Sec. and Treas.

Manufacturers of all descriptions of CAST STEEL, HAMMERED OR ROLLED.

SPIRAL AND ELLIPTIC CAR SPRINGS

RAILROAD AND MACHINERY FORGING.

CHICAGO: J. S. BREWER, 176 Jackson Street. Bridgeport, Conn. ST. LOUIS: J. H. WYETH, 221 Chestnut St.

AARON FRENCH, Chairman. JULIUS E. FRENCH, Vice Chairman. GEO W MORRIS, Gen. Man'r. D. C. NOBLE, Sec. and Treas.

THE A. FRENCH SPRING CO. LIMITED

PITTSBURGH, PENNA.

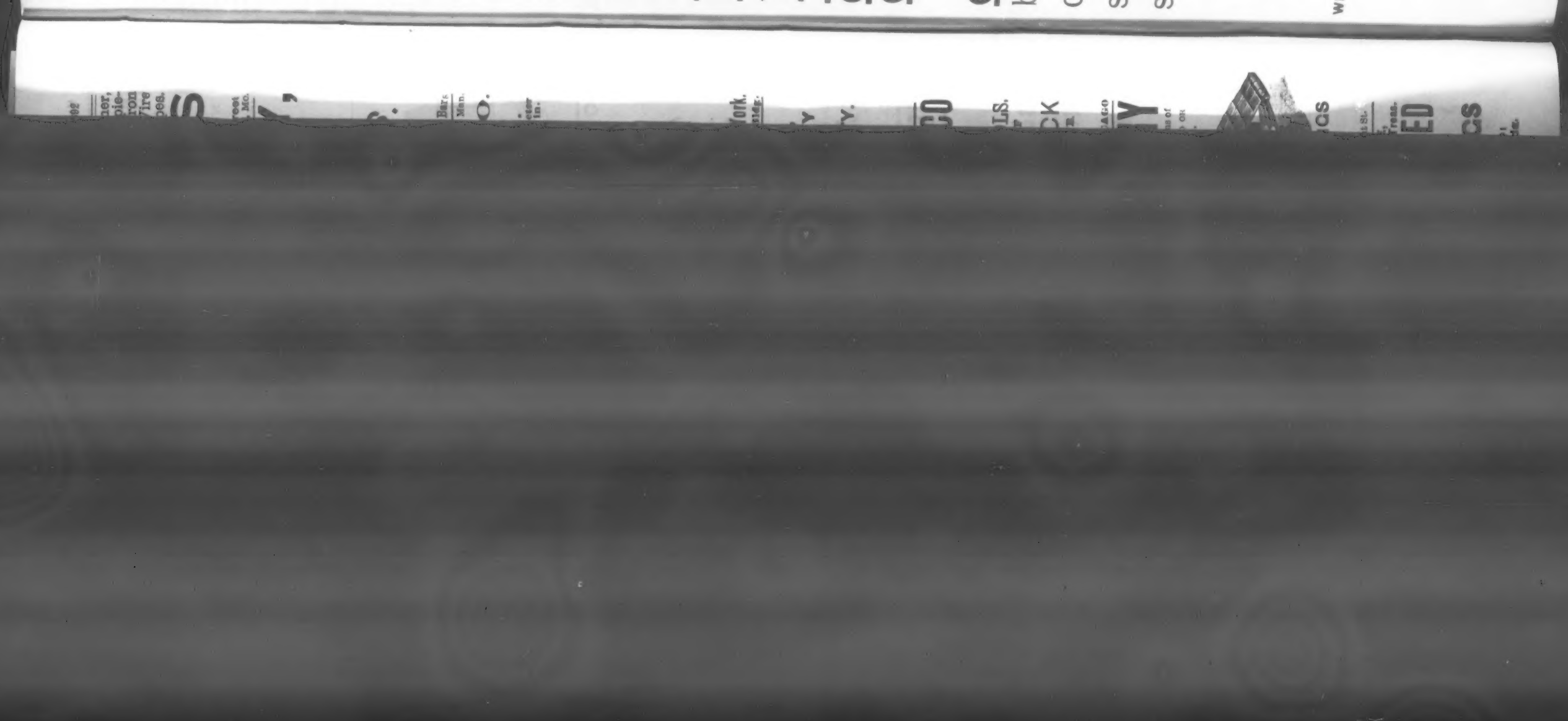
ELLIPTIC & SPIRAL SPRINGS

OF EVERY DESCRIPTION.

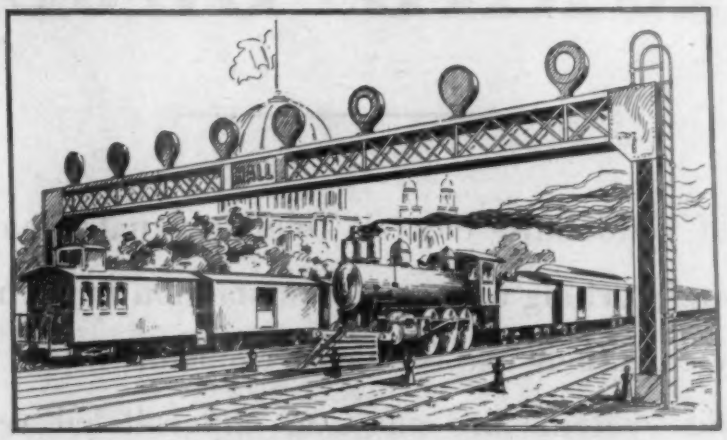
NEW YORK: 66 Broad St. Bldg. BOSTON: 62 Mason Bldg. CHICAGO: Phenix Bldg.

A
CE
HA
fo
TF
CF
CF
co
bl
co
sig
sw

WILLIA



WORLD'S COLUMBIAN EXPOSITION.



Hall Automatic Electric Block System on the Illinois Central Railroad.

AFTER the most thorough investigation ever made into the subject of block signals **THE ILLINOIS CENTRAL RAILROAD COMPANY HAS ADOPTED THE HALL SYSTEM OF AUTOMATIC ELECTRIC SIGNALS** for the protection of their entire **WORLD'S FAIR TRAFFIC** on their eight tracks from **CHICAGO** to **GRAND CROSSING** and four tracks from **GRAND CROSSING** to **KENSINGTON.**

THE CHICAGO AND NORTHWESTERN RAILWAY COMPANY HAS ADOPTED THE HALL SYSTEM for the block signaling of their Galena, Milwaukee and Wisconsin divisions, 87 miles of double track, 201 block signals, and also providing protection for 188 switches.

THE HALL SIGNAL COMPANY,

WILLIAM P. HALL, President. W. S. GILMORE, Treasurer. MELVILLE P. HALL, Secretary.
S. MARSH YOUNG, General Agent. C. W. BREWSTER, Sales Agent.
HENRY BEZER, Mechanical Signal Engineer. A. J. WILSON, Sup't Electrical Construction.
W. W. SALMON, Signal Engineer.

General Offices, 50 BROADWAY, NEW YORK.
Western Office, 340 THE ROOKERY, CHICAGO, ILLS.

A SIGNAL SUCCESS.

OUR SYSTEMS of automatic electric block signals (on wire and rail ci. are working with great satisfaction to the railroad companies u them, and in almost every case their use is being extended.

Our new rail-circuit systems are showing unparalleled results. Eleven of thes signals, on a certain road, have been operating over seven months with a record of but fou train stops (caused otherwise than by trains in block and open switches), and these wer due to signals being struck by lightning, one broken battery jar and to one broken ra They have also operated with ABSOLUTE RELIABILITY. From the reports of railroad com panies using other rail-circuit signals, we are justified in claiming that no such good result (or records) have ever before been shown.

Having substantiated our claims to the complete satisfaction of many leading railroa officials, we are now engaged in applying the systems on several new lines, and we are als engaged in preparing PLANS AND ESTIMATES FOR THE APPLICATION OF THE SIGNALS FOR MAN OTHER COMPANIES, several of whom do not consider any other signal than

THE HALL.

We pride ourselves on the excellent and honest character of our work, and beg to assure a who deal with us that they will be fairly and squarely treated, and always with the assurance satisfaction. All correspondence that may be addressed to our New York or Chicago office wi receive careful and immediate attention, and any inquiries on any subject relating to our specialtie will command the professional knowledge and skill of our engineering department.

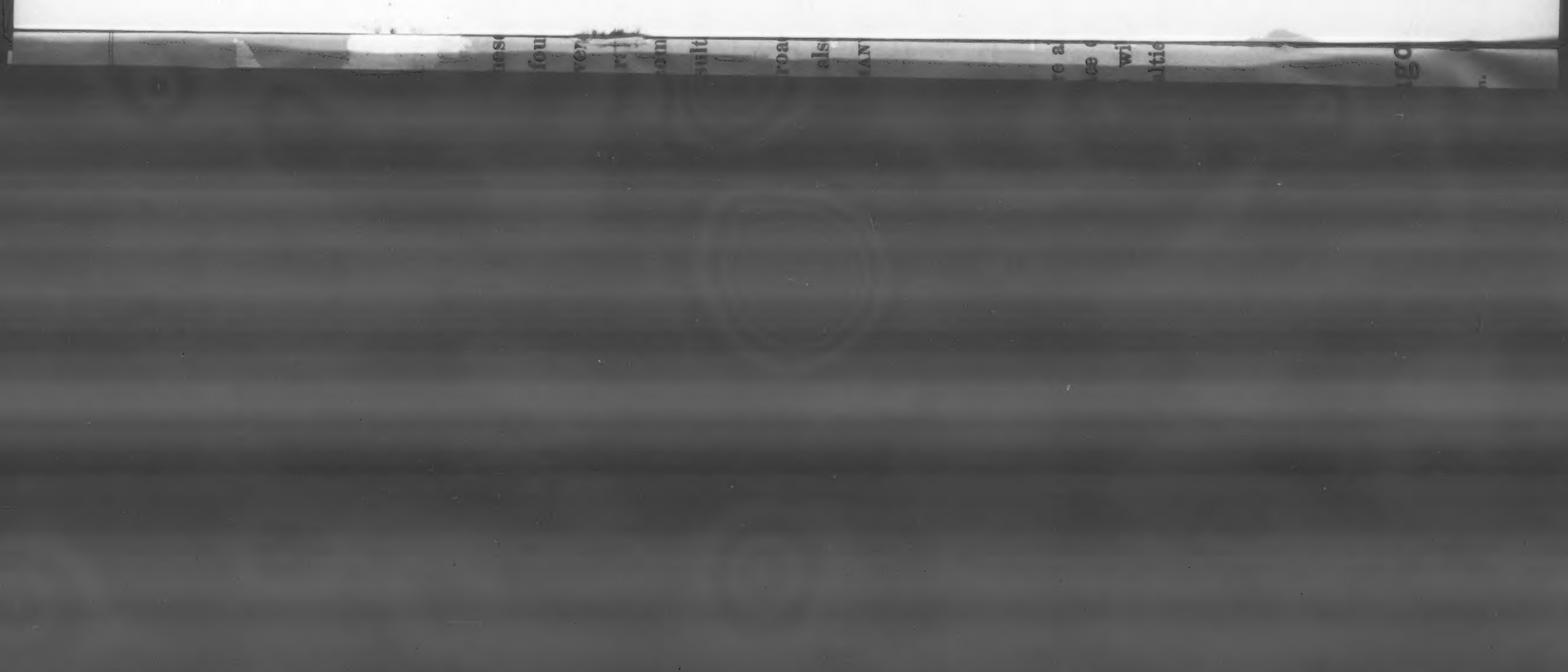
THE HALL SIGNAL COMPANY,

50 Broadway, New York. **340 The Rookery, Chicago**

WILLIAM P. HALL, President.
S. MARSH YOUNG, General Agent.
C. W. BREWSTER, Sales Agent.
HENRY BEZER, Mechanical Signal Engineer.

W. S. GILMORE, Treasurer.
MELVILLE P. HALL, Secretary.
A. J. WILSON, Sup't Electrical Construction.
W. W. SALMON, Signal Engineer.

thes
fou
wer
ra
com
sult
roa
als
IAN
e a
ce
wi
ltie
go



THE

KINSMAN BLOCK SYSTEM COMPANY,

CENTRAL BUILDING,

LIBERTY STREET, NEW YORK.

KELSEY RAILROAD SIGNAL COMPANY.

A. G. HILL, Treas. and Gen. Man. F. N. KELSEY, Gen. Supt. and Man. of Works.

Works, FLORENCE, MASS., U. S. A.

WE CLAIM and KNOW that we have the ONLY perfect single track block system. Cheap, reliable. Fully protects life and property. In successful operation on Erie lines west of Salamanca.

ROBERT GILLHAM, Prest. W. W. ALEXANDER, Vice-Prest. M. C. GILLHAM, Secy. & Treas.
E. R. GILL, General Manager and Electrician.

INDIVIDUAL TELEGRAPH CALL BELL SYSTEM

OF THE

Gill-Alexander Electric Manufacturing Co., Kansas City, Mo.

Patented and Patents Pending.

This new method of calling telegraph operators by a ringing bell is a valuable equipment for railway telegraph wires. Its use effects a saving of expense at many stations, and makes it possible to handle a larger volume of business with a fewer agents. All stations may be day and night offices with a single operator, and can be reached at any time with absolute certainty. It is of great value to the train dispatcher in the economical and safe handling of trains. The call requires but one sending, and is continued at the office desired without the use of the line circuit. The instrument works in the local circuit without interference with the sounder and without extra battery.

The Union Pacific Railway has used our instruments since August, 1889, with absolute success, and other railroads are using them with equal satisfaction. It is the only practical Individual Telegraph Call Bell yet invented.

We rent the instruments at a monthly rental, and guarantee maintenance. Complete information given on application. Correspondence is solicited.

Portable Drill, as applied to drill the saddles of locomotive cylinders.
Send for New Illustrated Catalogue of Machine Tools.

JAMES T. HALSEY.
26th and Callowhill Sts., PHILADELPHIA.

STOW FLEXIBLE SHAFT,

For Tapping and Reaming Stay Bolt Holes in Boilers.

Portable Drilling

STOW MFG. CO., Binghamton, N. Y.
Inventors and Manufacturers of the Stow Flexible Shaft for all purposes.

Stow Flexible Shaft Co., Limited,

26th, Callowhill and Biddle Sts., Phila., Pa

Manufacturers of

FLEXIBLE SHAFTS,

And all kinds of Machines to be used with them.

Portable Drilling, Tapping, Reaming and Boring Machines. Also Portable tools for emery wheel grinding, metal and wood polishing, cattle brushing and clipping, etc.

Builders of Special Machines for Railroads, Bridge and Boiler Makers, Contractors, etc.

DETROIT LUBRICATOR CO.'S

STANDARD

Locomotive Appliances.

DOUBLE and TRIPLE SIGHT-FEED CYLINDER —AND— AIR PUMP LUBRICATORS.

Garfield Injectors,

Pendry Throttle Valve,

ROD AND GUIDE CUPS.

Address

Detroit Lubricator Co.
DETROIT, MICH.

BOLT CUTTERS

Schlenker's Automatic Bolt Cutters and Screw-Cutting Machines.

HOWARD IRON WORKS, BUFFALO, N. Y.
Established 1845.

THE LAIDLAW & DUNN CO.

WORTHINGTON

STEAM PUMPS

For RAILWAY WATER SUPPLY.

FIRE PUMPS, TANK PUMPS,

BOILER FEED PUMPS,

GAS HOUSE OIL PUMPS,

Water Meters, Oil Meters.

HENRY R. WORTHINGTON,

86 & 88 Liberty St. and 145 Broadway,

NEW YORK.

70 Kilby St., BOSTON. 607 Arch St. PHILADELPHIA. 93 & 95 Lake St., CHICAGO.
404-406 Walnut St., ST. LOUIS. 338 Sibley St., ST. PAUL.

NEW, REVISED, ENLARGED EDITION

—OF—

THE TRAIN WIRE.

A Discussion of the Science of Train Dispatching, by J. A. ANDERSON, of the Pennsylvania Railroad, with an Introduction by B. B. ADAMS, Jr., of the Railroad Gazette.

152 Pages (5 x 7¼ in.). Price $1.25.

The first eight chapters are discussions of the general principles, and treat of: Train Dispatching, the Dispatcher, the Operator, the Order (with photographic illustrations of very good and very bad manuscripts, the Manifold, the Record, the Train-Order Signal, the Transmission. Chapter Nine contains the standard code of rules for the movement of trains by telegraphic orders, with comments on each rule, giving valuable practical advice as to its application in special cases, and making its purpose and necessity clear. Chapter Ten contains the standard forms of train orders, and the remaining chapters treat of rules as to rights of track, numbering switches, &c. The book is complete and exhaustive as a practical handbook and course of instruction for an inexperienced operator, and there are few superintendents or dispatchers who may not learn much from Mr. Anderson's long experience in this department. He is probably the best authority in the world on train dispatching.

Published and for Sale by THE RAILROAD GAZETTE 73 Broadway N. Y.

R. D. WOOD & CO. *Engineers, Iron Founders, Machinists,*

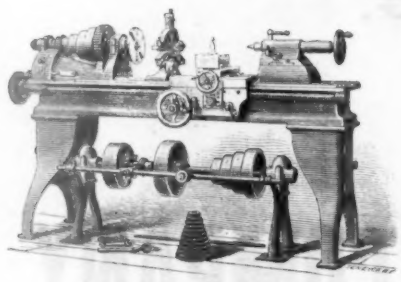
PHILADELPHIA, PA.

CAST IRON PIPES.

HYDRAULIC TRAVELING CRANES.

Hydraulic Cranes, Presses, etc. Hydraulic Car and Freight Lifts.

HEAVY LOAM AND MACHINERY CASTINGS.



BROWN & SHARPE MFG. CO.,

Providence, R. I.

Screw Cutting Engine Lathes.

Valves For Regulating Steam Pressure

AND AIR BRAKE PUMPS are made and sold by us to nearly all the railroad systems of this country.

MASON REGULATOR CO.,

BOSTON.

PURE ALUMINUM.

The Pittsburgh Reduction Co., 116 Water street, Pittsburgh, Pa., offer Aluminum guaranteed to be equal in purity to the best in the market at the lowest rates obtainable. Prices given on application. Aluminum sheet, wire and castings at best rates.

Aluminum polish, very efficacious and non-poisonous, suitable for household use as well as for manufacturing purposes.

ALUMINUM SOLDER. CORRESPONDENCE SOLICITED.

Facts on Varnish.

NO. 105.—IT IS GETTING ABOUT, THOUGH.

Varnish-knowledge is of a sort to spread very slowly; it is so entangled with business interests.

MURPHY VARNISH COMPANY.

FRANKLIN MURPHY, President.

Head Office: Newark, N. J.

Other Offices: Boston, Cleveland, St. Louis and Chicago.

Factories: Newark and Chicago.

THE Q AND C CO. CHICAGO AND NEW YORK.

The Q and C Co. Chicago & New York.

THE Q AND C CO. CHICAGO AND NEW YORK.

SERVIS TIE PLATES

Wagner Car Door.

Sets in flush with side of car. Its great merit proven by long years of continuous use on thousands of cars. Sold on royalty basis. Blue prints, sample fittings and full particulars furnished on application.

WAGNER CAR DOOR CO.,

INDIANAPOLIS.

American Flush Car Door.

Sets in flush with side of car. Runs on rollers. Absolutely tight car; utmost ease of motion. We furnish the fittings for this door out of refined malleable iron. Blue prints sample fittings and full particulars furnished on application.

AMERICAN CAR DOOR CO.

SPRAGUE, DUNCAN & HUTCHINSON, Limited.

FRANK J. SPRAGUE,
LOUIS DUNCAN, Ph. D.,
ALFRED BISHOP MASON,
CARY T. HUTCHINSON, Ph. D.

CONSULTING ELECTRICAL ENGINEERS.

15 WALL STREET, NEW YORK.

ASBESTOS CEMENT FELTING

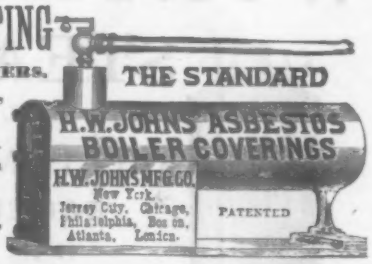
For LAGGING LOCOMOTIVE BOILERS.

Samples and Descriptive Price List Free by Mail.

We are prepared to take Contracts for applying Steam Pipe and Boiler Coverings in any part of the United States.

H. W. JOHNS MANUFACTURING CO.

87 Maiden Lane, NEW YORK.



ARTIFICIAL STONE AND ASPHALT PAVEMENTS

ESPECIALLY ADAPTED FOR RAILWAY STATION PLATFORMS, ROUND HOUSES, FLOORS IN SHOPS, ETC.

REFERENCES: PENNSYLVANIA RAILROAD CO. ADAMS EXPRESS CO.

WEHN PAVEMENT CO.,

16 & 18 EXCHANGE PLACE NEW YORK

TRAUTWINE'S POCKET BOOK.

"The most useful hand-book in the language for the engineering profession."—*Engineering and Mining Journal*, Aug. 25, 1888.

BELT, CORD AND COUPLING.

Solid Braided Cord for Railroad Service.

SAMSON CORDAGE WORKS.

SEND FOR SAMPLES. 115 CONGRESS ST., BOSTON.

EDWARD SMITH & CO., RAILWAY VARNISHES, Times Building, NEW YORK

RAILROAD GAZETTE

FRIDAY, MAY 20.

CONTENTS.

ILLUSTRATIONS:	PAGE.
Erecting the Manufacturers' Building at the World's Fair	361
Pa kerton Yard — Lehigh Valley Railroad	364
Hinckley's Automatic Brake Slack Adjuster	366
Irrigation on Consolidated Land & Irrigation Co.'s Farm near Huron, S. D.	364
The Laboratory Locomotive of Purdue University	365
The United States Coupler	366
Automatic Knife Grinding Machine	367
CONTRIBUTIONS:	
Erecting at the World's Fair Buildings	361
Railroad Economics Twenty-seven Years Ago	361
Locomotive Testing Laboratories	361
To Avoid Running Past Red Lights	362
EDITORIALS:	
Disputed Points in Railroad Bridge Designing	370
The Railroad Commissioners of New South Wales	371
The Mexican Railway	371
EDITORIAL NOTES	370, 372
NEW PUBLICATIONS	372
TRADE CATALOGUES	372

GENERAL NEWS:	PAGE.
Locomotive Building	376
Car Building	376
Bridge Building	376
Meetings and Announcements	376
Personal	377
Elections and Appointments	378
Railroad Construction	378
General Railroad News	379
Traffic	380
MISCELLANEOUS.	
Technical	375
The Scrap Heap	375
Freight Yards	362
Bridge Shop and Rolling Mill Notes	363
The New York Rapid Transit Commission	367
The American Locomotives in New South Wales	367
Effect of Temperature on the Strength and Ductility of Metals	368
Ontario & Western Terminus at Cornwall	369
English Train Accidents in 1891	369, 372
Rules of Interchange, New England Railroad Club	373
Floods in the West and South	373
An Incline Cable Railroad for Transferring Freight Cars	374

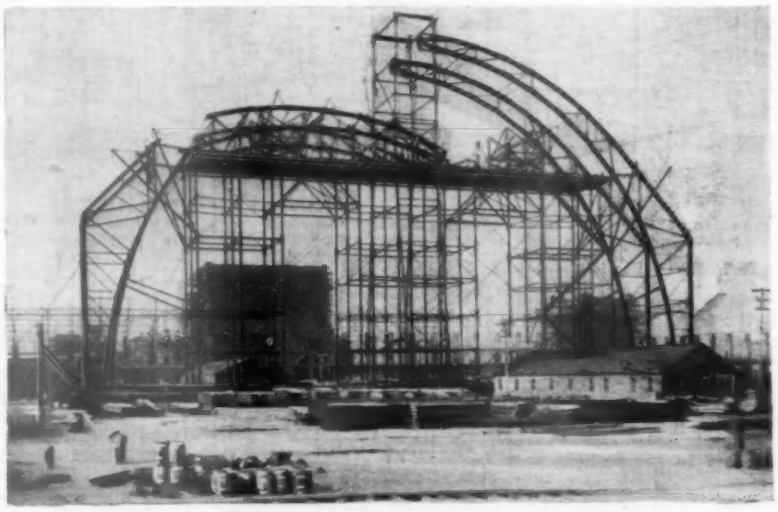
Contributions.

Erecting at the World's Fair Buildings.

Office of D. H. Burnham, Chief of Construction, World's Columbian Exposition,
CHICAGO, May 11, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of May 6 is a note from *Hoisting* which says that the main trusses of the Manufacturers Building "are to be raised in position from the floor."



Erecting the Manufacturers' Building at the World's Fair.

The inclosed photograph shows the actual process. The arches are built up in sections for about two-thirds of the height, the top third is then laid out on the platform of the traveler and hoisted into position.

One arch with its purlins weighs about 350,000 lbs., but the final lift of parts of two arches is only about 40,000 lbs. This method of erection was designed by the Edge Moor Bridge Works and is proving very successful.

JOHN WORCESTER,
Superintendent Iron Work, Manufacturers' Building.

Railroad Economics Twenty-seven Years Ago.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the course of my reading I lately came across the following: "Whatever may be the immediate effect of competition between railroads, its ultimate results, where capital is brought into the contest in excess of a demand for its use, is to tax commodities with the increased interest which such capital in the end always exacts."

This smacks of Farmers' Alliance economy; it might be said there is hayseed in its hair. But no sockless Socrates wrote it. It was found in the 19th report of the Pennsylvania Railroad, and the names of J. Edgar Thomson and Thomas A. Scott are appended to it. It will, in view of the above quoted sentence, be of interest to see to what extent the Pennsylvania Railroad Co. has been able to exact a tax on the $103,082,050 of additional stock and the $57,709,286 increased bonded indebtedness made since 1865, the date of the report quoted from. In 1865, the year covered by the report, the freight transportation on the Pennsylvania road amounted to 420,060,260 ton miles, and the freight receipts were $11,193,565; the receipts per ton mile being 2.665 cents. In 1890 their freight business amounted to 6,904,332,633 ton miles, and the receipts per ton mile were 0.655 cents. In other words, to earn a little over four times as much freight money, they had to perform fully 16¼ times as much service.

What do you suppose Messrs. Thomson and Scott thought they meant when they wrote about capital taxing commodities? N.

[We suppose that they meant what they said, that if more capital than necessary were invested in transportation enterprises, higher rates would be required to pay interest on it than if the capital were smaller. Mr. Thomson was apparently justifying the company's conduct in limiting its expenditures for additions to the property, when everything cost about three prices and as much probably as 15 per cent. had to be paid on the gold value of an issue of bonds. He does not say in the quotation cited that rates would have to be *raised* if the capital was unnecessarily large; and he does not anywhere intimate that addition to the capital should not be made to make additions to the company's property; it is the provision of "capital in excess of the demand for its use" that he condemns and properly. As for the comparisons of the capital traffic, etc., of the Pennsylvania Railroad Company now and in 1865 they have about as much relevancy as a comparison of a farm of a hundred acres with another of a thousand, including the same hundred and going by the same name. Since 1865 the Pennsylvania Railroad Company has expended $108,000,000 for the stocks and bonds of other companies, representing property as distinct from the Pennsylvania Railroad as the Suez Canal or the Temescal Tin Mines. It controls 7,915 miles of railroad, against a little more than 800 in 1865. The line whose traffic our correspondent cites measured 2,389 miles in 1890 and about 800 in 1865. Even the comparison of rates is vitiated by the great difference in the currency. In 1865 the price of gold in the currency of the country ranged from 234 to 128¼, and averaged 157. The 2.665 cents per ton mile received by the Pennsylvania Railroad in 1865 was equal to only 1.70 cents in our present currency. It is a sufficient achievement to have reduced this 1.045 cents, without comparing depreciated greenbacks with gold prices so as to make it appear to have been reduced 2.010 cents. —EDITOR RAILROAD GAZETTE.]

Locomotive Testing Laboratories.

ST. LOUIS, May 12, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The letter in the *Railroad Gazette* of April 29 on "Locomotive Comparisons" touches upon the subject of shop tests of locomotives which it seems to me is worthy of more attention than it has as yet received. There are many reasons why shop tests can be made in general to give far more satisfactory results than can possibly be obtained from road tests, the principal reason being that in most cases every condition can be made practically constant except the one which it is desired to test.

For example, take the problem of exhaust nozzles and diameters of stacks. We may discuss it by the hour, and *prove* nothing, or we may fit one engine this way and another that, put them on the road, and keep as accurate a record as possible for a month, and at the end of that period it will probably be found that the variations in train weights, condition of track, delays, etc., etc., have been so great that the net result is that nothing has been proved. On the other hand, the same time devoted to a systematic series of tests in the shop, *changing one thing at a time* would prove much. The same is true of a multitude of other factors in locomotive design.

Take valve gears as another example. Every month or so some reinventor of some old device turns up with a revised edition, and being gifted with Israelitic assurance and an Irish tongue, persuades a few lawyers, doctors and other non-mechanical men that the mechanism is the panacea which all engineers since the time of Watt have been searching for in vain. So a company is formed and means provided, and the more readily accessible master mechanics and other railroad officers are badgered to have a locomotive fitted with the panacea without expense (?) to the railroad company, and it is widely and frequently announced in the technical press that the A., B. & C. road is testing the Panacea valve gear. Then rumors of the remarkable economical characteristics which it has developed are circulated for a time, until they finally cease, and the Panacea disappears from public view, to be followed by the Simplex or something else, and so it goes on. It is certainly true that if the time which railroad officials are compelled to devote to inventive cranks and promoters were charged up, the sum total would be too large to be neglected.

A remedy for a large part of this would be found in the establishment of railroad testing laboratories at the principal railroad centres. Equip these laboratories with all necessary apparatus for shop tests of locomotives and railroad appliances; put competent men in direct charge of the work, and place the whole under the general direction of three superintendents of motive power or mechanical engineers who shall decide upon the character of the work to be done in the laboratory, and who shall have no personal interest in any device tested. Suppose such a laboratory to be established in or near Chicago, for example; the expense of equipment and operation if divided among the railroads centering there would be small, and would, I believe, pay for itself in a year by the saving which could be effected in the single item of coal by a thorough knowledge of the most economical methods of burning the various kinds used on the different roads. While none but the largest roads can afford to maintain a well-equipped mechanical laboratory, a joint laboratory could be operated at slight expense to the individual members, and many problems could be left to it for solution, among them the vendors of revolutionizing devices. Perhaps this sounds visionary, but I am confident that the commercial feasibility and advisability of the scheme will be apparent to anyone who will think over it.

During the last year there have been quite a number of road tests of compound locomotives which have given us additional evidence that such engines are, in general, more economical than simple engines, but they furnish very little data upon which to base an estimate of the probable saving in any given class of work. In several sets of tests on the same road the saving over the competing simple engines ranges from nothing to 15 per cent. In other tests it was found to be 25 per cent. and over. In some of these tests we can find apparent reasons for the differences, but we cannot fit values to the explanations and demonstrate, for example, that if the conditions had been such and such the 25 per cent. would be reduced to 20 or the reverse. A just comparison of many of the results is totally impossible. But if an engine testing laboratory was in existance, and we knew from tests of a simple engine what its coal and water consumption is, say, per 1,000 lbs. pull on the drawbar at various speeds, and compound cylinders are put on that engine and a similar series of tests are made, we will know the actual saving which can be secured by that form of compounding, every other factor being as nearly identical in the two tests as is practicable. It is probable that if such a laboratory had been in use we would now have much more complete knowledge of the actual value of compounding than has been gained by many road tests, and at much less expense. The same is true of many other factors concerning which much has been said and written without facts to start with, and therefore naturally without much result.

There are some questions of which durability and cost of maintenance are the most important, which can be better determined on the road than by shop tests, but the great majority of the factors in locomotive design which are as yet unproven can be more thoroughly, quickly and cheaply determined in the testing shop than anywhere else. If anyone doubts the feasibility of shop tests let him visit the Purdue University laboratory at Lafayette, Ind., where the first laboratory locomotive in this country has been erected. This is a good start in the right direction, but an experimental locomotive in a college laboratory will not serve to answer all the questions, the lack of answers to which means a daily loss of dollars to railroad companies. The primary object of a college experimental engine is instructive to students, and it is therefore but one machine among many, all of which must receive attention in turn. It is not probable that many such engines will be erected in college laboratories, as their use must be in general confined to railroad problems and comparatively few graduates of technical schools go into railroad employ as they find better pay and more rapid promotion in other lines of work. There is no sound reason, however, why several railroad companies cannot combine and maintain such a laboratory with profit to themselves. Such a laboratory could be equipped and maintained by the railroads entering Chicago for one-tenth of one per cent. of the money they spend annually for fuel. Are there any master mechanics who are absolutely certain that their locomotives are so near perfection that a five per cent. saving is impossible?

Some years ago a steel and iron company which had been maintaining a makeshift chemical laboratory in a happy-go-lucky fashion decided to employ a thoroughly trained chemist. The demands he made for appliances, etc., etc., were at first very grudgingly complied with, but in the course of time, when it had been clearly demonstrated that the company had been blowing dividends up the stack for years and otherwise losing dollars in the care for pennies, the value of well directed investigation began to be appreciated and the chemist's requisitions were no longer cut. Some, if not most, of our railroads are blowing dividends up the stack to-day. A well equipped and well manned testing laboratory will go far toward putting these dividends where they belong.

ARTHUR T. WOODS.

To Avoid Running Past Red Lights.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the discussions relative to signal lights which have appeared in the *Railroad Gazette*, the opinion seems to be that red is the proper color to show danger. This is, without doubt, the verdict of the large majority of railroad men and signal engineers. Red has been adopted not only on railroads, but under all circumstances where danger must be made known at night by lights. To change from this established world-wide practice would involve a greater amount of effort and time, and a more complete agreement and understanding, among the railroads alone, than the establishment of standard time or uniform freight rates.

While it is comparatively easy for any individual railroad to adopt any form or color to indicate danger, caution and safety on its own signals—and independent action has been taken on several roads already—there are no two such roads that agree as to what these forms and colors should be. Allowing then that it would be inexpedient to change the meaning of the various established colors used for night signals, and in the absence of any satisfactory form signal which will have the same appearances day and night, it remains to railroad managers and signal engineers to make the generally adopted forms and colors as nearly perfect as possible. The greatest difficulty in this matter lies with the night signals, which must be color signals. The semaphore and disc meet all the requirements for day signals, and their color is of little importance. In fact, it would seem quite useless to maintain any colors on these other than such as will render them visible for the greatest distance and under all conditions of atmosphere and surroundings.

Granting that a red light shall always indicate danger and that when it is exhibited a train shall stop, it becomes necessary that a red signal shall never be passed, even if it appears in combination with another color, as white or green or blue, or in the case of a signal post bearing two or more signals, as at a junction where each semaphore is furnished with its own lamp, exhibiting as many red lights, when at danger, as there are signals on the post. When one route is cleared, the light for that route turns to white, or such light or lights as may be arranged for, leaving, of course, the other lights red This indicates to the engineman that a certain route is clear, but he must pass the red lights of the other signals on the same post. This interferes with the rule that no movement shall be made against a red light. It would be well, then, to arrange that the clearing of the signal for any of the routes should screen the red lights or change them to some other color, sufficiently visible to make their respective positions on the post apparent to the engineman. This would obviate the necessity of running past *any* red lights, and the emphasis laid on the observance of red lights would be strengthened.

Such a device has been patented recently by Mr. W. W. Salmon, Signal Engineer of the Hall Signal Co., and it is believed by those who have seen it to meet every requirement. It is capable of a variety of applications, and possesses one of the most essential features for exhibiting and maintaining a danger signal at night where, by accident or design, a red glass in a semaphore spectacle has been broken. With Mr. Salmon's device the clearing of any one signal screens all the others on the same post, so that the breaking of even all the red glasses would be no serious matter as only one signal light at a time (at white) can mean a clear signal, and, of course, more than one would be equal to none at all, since only one route at a time can be cleared, and more than one white light would arrest the attention of the engineman. This device is simply a blue spectacle, so fixed in relation to each signal light on a post that whenever the red spectacle is pulled away from any signal on the post the same movement will, by a suitable rod connection, pull a blue glass up to a position in front of each of the other lights on the post, which ordinarily exhibit red, of course. This blue in front of the red changes the light to violet, and there is therefore no danger signal to be passed, contrary to rules, by the engineer who is acting in accordance with the indication given by the one white light. Mr. Salmon puts a wire screen over the blue glass, thus protecting it from ordinary breakage, and the wire of this screen can be varied in size so as to make the light dim if it be deemed desirable to do so. This device is easily and cheaply applicable to any of the existing forms of semaphore signals.

It is important to reduce the number of lamps to one, at most, for each signal. The Pennsylvania, the most advanced road in the country, may be taken as a model. Most other roads have followed its lead, more or less, in improvements. On this road the red light is adopted as the danger signal, the green as caution and the white as safety. One lamp only is used for each signal and the three positions of the semaphore: horizontal for danger, inclined at 45 degrees for caution or permissive, and vertical for all clear, are produced in the night signal by means of double spectacles bearing red and green, which are brought in place before the lamp corresponding with the reepective positions of the semaphore blade. These three-position signals are used principally as station signals, however. The block and interlocking signals are capable of only two positions; horizontal means stop and inclined go ahead; at night red means stop, and white go ahead. The great danger arises, however, from a broken red or green glass. When this occurs a white light is shown.

Another code is that adopted by the Chicago & Northwestern, consisting of a combination of lights. On the interlocking signals the danger signal is red, the clear signal green and the caution signal green and red. Here no white light is exposed, and if it is it means stop at once. The train order signals, however, are red for danger or stop and white for clear or go ahead. While an engineman usually knows his location on the road and need not mistake a train order signal for one at an interlocking plant or block signal, it would appear that, having become accustomed to white for clear in some cases he might not stop on finding a white light where a glass had broken. A good chance for confusion arises here. The lamps necessary to produce these combinations of colors must, of course, cost more than a simple lamp.

The Boston & Albany has, perhaps, the most expensive and cumbersome arrangement for night signals. Here three lamps are employed on each signal. The expense is therefore triple that of the Pennsylvania for lamps alone, and the possible delay to trains consequent on a light being extinguished is three-fold. This, coupled with the fact that after all no better or surer signal is produced by the arrangement, would appear to be an argument against this system.

Every existing device for signaling has been constructed to exhibit a red light at night for danger [The Boston & Albany is an exception—EDITOR] and a green or white light for safety, but little or no thought has been given toward making these red lights absolutely reliable; and until Mr. Salmon's device appeared, no pains were taken to maintain the dignity of a red light. His is the first important step in the direction of improving the existing standards for night signaling, and we may look now for other advances.

R. C. E.

Freight Yards.

BY A. MORRISON.

[In our issue of March 25, p. 223, appeared a discussion by two superintendents of the fundamental principles of laying out freight yards. Mr. Morrison now makes a further contribution to the same discussion, with a special application.—EDITOR.]

DIVISION JUNCTION YARDS.

Every railroad man who is familiar with the selection and construction of division junctional yards is cognizant of the many difficulties arising from the topographical peculiarities of available sites; also the many special features that are necessary in their construction, making each yard a special study in itself. It rarely, if ever, occurs that two yards of equal importance can be constructed alike. In the selection and construction of such yards, there are a few prominent features that should be observed, and while it may be impossible to obtain all of them, some at least should predominate in governing the selection of the site and its construction. I will here mention a few of the more important fundamental principles governing the selection and construction of such a yard:

1. A site topographically suited for a yard at least twice the length of the longest trains running in the direction the yard is intended for.

2. A yard of such topographical proportions that the proper number of parallel tracks can be obtained within a reasonable outlay for grading, to suit the requirements of the business, usually not to exceed 12 such tracks on each side of the main line.

3. A site where the main line has a grade of about 0.5 per cent., so that cars will run by gravity, for the trains going in one or both directions, preferably the direction the greatest haul of loaded cars is in.

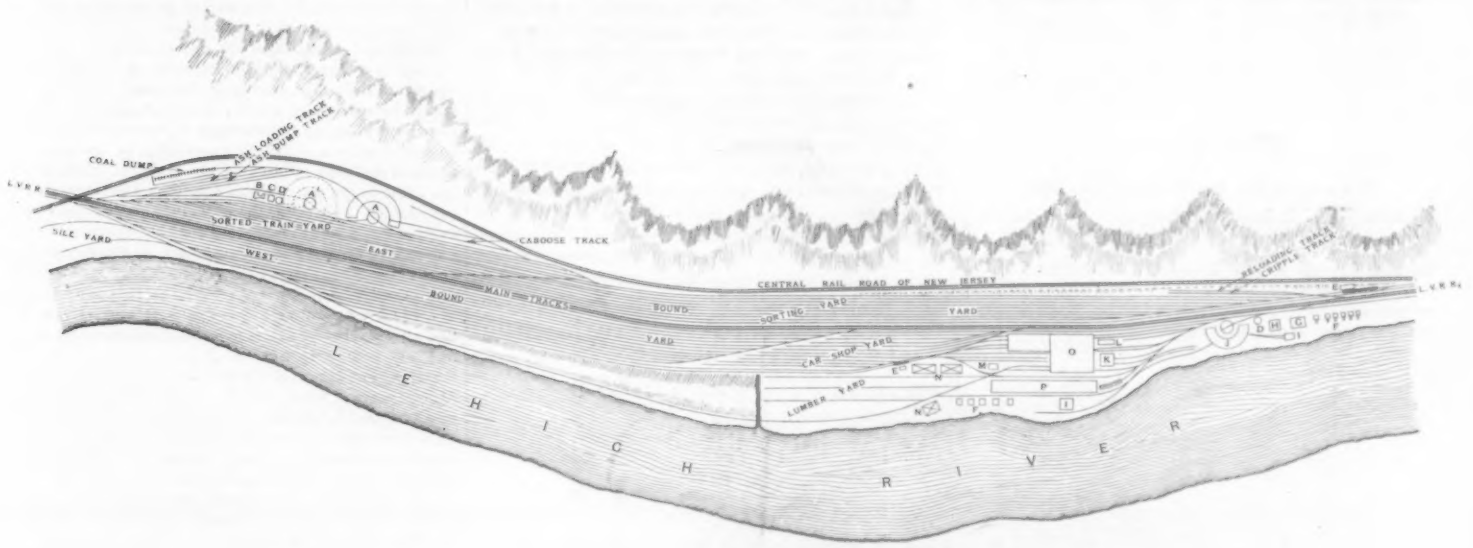
4. A site possible for the construction of a yard on both sides of the main tracks, void of all curves, except those necessary on account of leaders, and especially clear of obstructions for the proper signaling of trains.

5. A site such that the necessary engine houses, water cranes, coal and ash dumps, sand and oil houses, also repair shops, can be conveniently located with separate ingress and egress tracks to same.

6. A receiving track at entrance end of yard for all cars designated to pass through the yard, either for sorting or weighing, or sufficient length to accommodate all such trains, without crowding the sorting facilities of the yard, as well as the efficient weighing of the same.

7. The arrangement of the yard so as to make unnecessary the extravagant use of frogs on leaders, or otherwise necessitating curves heavier than 12 degrees; also the absence of all complicated switches, such as double and single slip switches, double crossovers and crossings.

8. The yard to be divided into two parts, so that the sorting yard will have tracks long enough to accommodate the maximum train, and the sorted train yard, tracks to



Scale: 1 in. = 350 ft. (*approximate.*)

NOTE.—*A*, engine-house; *A'*, engine-house, partially constructed; *B*, oilhouse; *C*, sandhouse; *D*, water cranes; *E*, weigh scales and offices; *F*, dwelling-houses; *G*, forwarding office; *H*, passenger station; *I*, boiler-house; *J*, engine-house and caboose paint shop; *K*, machine-shop; *L*, offices; *M*, storehouse; *N*, dry sheds; *O*, car shop; *P*, blacksmith-shop.

PACKERTON YARD—LEHIGH VALLEY RAILROAD.

accommodate the maximum outgoing trains, and to have all leaders parallel with each other, so that a uniform length of tracks may be practically obtainable.

9. All tracks parallel and not closer to each other than 12 foot centres so as to admit of car repair work being done.

10. All frogs, as far as practicable, of the same number, and all switches, preferably point switches, to be made of uniform dimensions.

11. Car repair shops preferably convenient to the receiving end of yard that has the greatest haul of loaded cars, so that all cripple cars can be shifted out and into the repair yard before passing through the main yards, and these shops to have a separate yard for their convenience.

PACKERTON YARD, LEHIGH VALLEY RAILROAD.

The plan herewith shows the yard of the Lehigh Valley Railroad at Packerton, Pa., it is located at the nearest practicable point to the junction of the various coal branches of that road, and is used principally for the weighing and sorting of all its eastbound coal, also the westbound local freight. The eastbound freight has a yard for its accommodation about two miles further east, made necessary on account of limited room in Packerton yard.

This yard lies between the Central Railroad of New Jersey and the Lehigh River. It has a uniform descending grade in the direction the coal is hauled of about 5 per cent., and an extreme length of 7,400 ft., also a scale or receiving track nearly a mile long.

As shown on the plan, the main tracks separate the east and west bound yards. The eastbound yard is used exclusively for weighing and sorting all eastbound coal. It is divided by a leader of about two-thirds the length of the yard from its upper end. This was necessary to accommodate the maximum trains from the mining regions, being so much longer than that of trains leaving the lower yard, due to the more favorable grade on the coal branches.

The westbound yard accommodates all the return empty coal cars bound for the mines, also all local freight trains, from which point they are separated for adjoining divisions. All other western freight is sorted and weighed before reaching this point, and is, therefore, not detained in this yard.

The sorting yard, which is the upper division of the eastbound yard, has a separate track for all destinations receiving large quantities of coal, and as soon as a large train of coal accumulates, an engine merely starts the train, when it runs by gravity into the outgoing or sorted train yard, from which point the trains are started eastward.

At the point the scale or receiving track connects with the main tracks, at its upper end; trains enter the same without stopping, the engine merely cutting loose in time to run ahead, so that the switch can be thrown between it and the train; before the train has completely entered the caboose is in turn cut and falls back far enough to admit of the switch being thrown for the main track behind the train, when the engine couples to the caboose and proceeds to the house.

This train as soon as entered is managed by yard brakemen, and is allowed to drift slowly toward the yard. On its way the bills of cars are removed and cars marked by number in chalk, designating the track the cars have to be sorted into and the bills belonging to each lot of cars for one shipper are tacked on the last of such cars. When this has been done the car runners or brakemen cut them into lots for sorting according to their chalk number, and as they pass along they are carefully inspected and any defective car is marked with chalk, designating its disposition for repairs. If these are slight they are sorted with the other cars and repaired in the yard; if requiring to be reloaded into others, they are run into the reloading track, if not, they are removed by an engine into the car repair yard, as also the empty cars after they are unloaded. All cars are again inspected before being allowed to pass into the lower yard.

The track between main track and leader, and receiving or scale track, is for the convenience of the ram or pole cars, one of which operates above the scale, and one along the leader, the former to start lots, or trains, when stopped for any cause, and the latter to start the lots should they be stopped accidently, or due to stiff running cars, so as to keep the leader clear. This does not often occur, so that this car is principally engaged running brakemen, who require to go to near the lower end of the sorting yard with their lots, back to resume the same operation beginning above the scale.

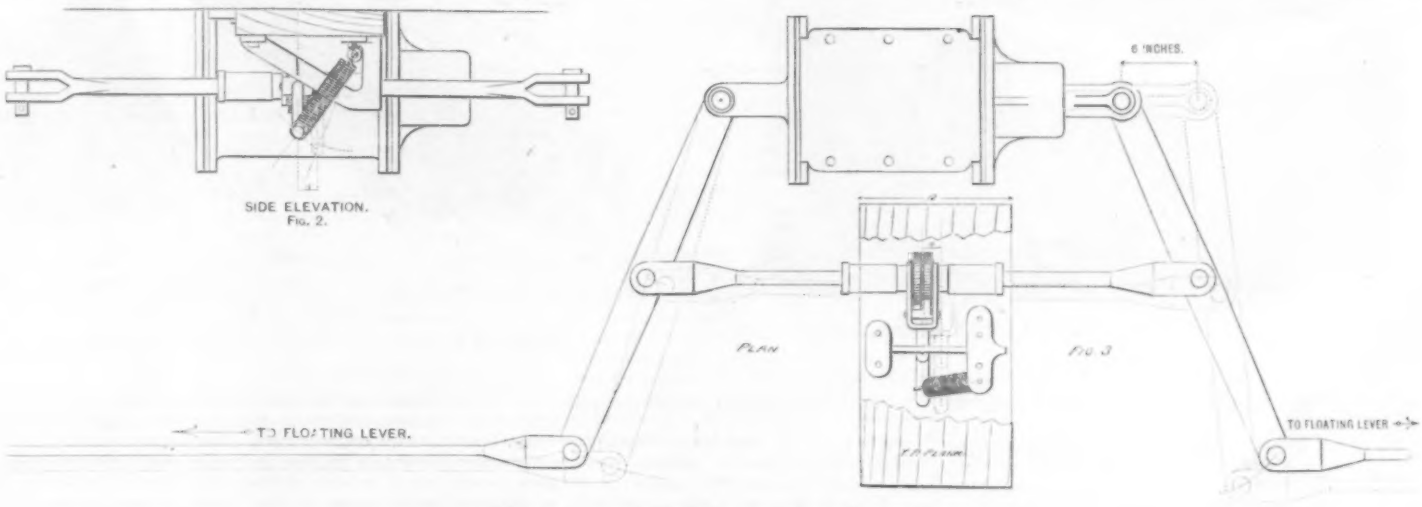
The scale on which all coal is weighed at upper end of sorting yard is long enough to weigh nine 6-ton coal cars, providing they were stopped to be weighed; but as that would be a serious delay and a source of expense in giving these cars a start before they would run themselves, they are weighed while in motion, limiting the number in each lot to seven such cars, thus giving the weighers a sufficient chance to weigh and allow the cars to pass along, and into the yard without stopping in not less than nine car lengths distance between each lot.

The economical features of this descending grade are quite evident when it is once considered that it quite frequently happens that trains of coal cars from the time they arrive at the upper end of receiving track, do not stop until they pass clear through to the outgoing or train sorted yard, ready to continue to their destination eastward.

The engines hauling this coal east of the yard, after coming from the engine house and receiving their supplies, take their caboose from the caboose track near engine house, and passing to leader at upper end of the lower yard, fly the caboose in behind their train, and the engine then proceeds to the lower end where it gets ahead of its train.

The greatest quantity of coal weighed in 12 hours on this scale is 4,000 six-ton cars, and as many as 6,000 six-ton cars have been weighed in 17 hours.

Hinckley's Automatic Brake Slack Adjuster.



HINCKLEY'S AUTOMATIC BRAKE SLACK ADJUSTER.

The Hinckley Automatic Brake Slack Adjuster.

There has just been put upon the market, by the Hinckley Brake Co., of Trenton, N. J., a brake slack adjuster, for automatically taking up the slack in brake rigging caused by the wear of brake shoes. An earlier form of the apparatus was shown in our issue of Jan. 22. At the same time we published a record of two month's tests showing the comparative variation of piston travel with automatic and hand take up. The apparatus, which is illustrated herewith, consists of a two part cylinder rod (fulcrum rod) threaded into a pipe swivel, which has keyed to its interior surface two ratchets, reversely set, operated by a short lever and pawl. The upper bend in the lever, as shown in the perspective view, and also in the side elevation, fig. 2, is held up by a spring to the under edge of a triangular shaped bracket bolted to the under side of the floor sills, beside the brake cylinder. The upper end of the spring is adjustably fixed to the bracket by means of a screw eye, and the other end is slipped on to the lower end of the operating lever.

The operation of the adjuster is evident from the illustrations, and is designed to hold the stroke of the brake cylinder piston at 6 in., although this may be varied either way if desired when the bracket is attached to car.

The adjuster being set as shown in figs. 2 and 3, when brakes are applied, the operating lever is deflected downward by the bracket, the slope of the latter being such as to allow of the top pawl on the right-hand ratchet dropping into the next tooth below the one in which it was, at the start, whenever the stroke of the piston slightly exceeds, say 6 in. This done, upon the release of brakes, the fulcrum rod moves back to its original position and the operating spring is left free to pull up the lever firmly against the under edge of the bracket, there being then only a slight tension on the fulcrum rod, the brakes being off. In this way the fulcrum rod is shortened whenever the deflection of the lever by the bracket is sufficient. It is found that the tendency of the adjuster is to *assist* the return of rods and levers upon release of brakes to their normal position.

There is of course but one adjuster on a car, which compensates for wear at both trucks. In service, the upper ends of the dead levers are preferably immovably secured, and both dead lever guides may be dispensed with.

When new shoes are to be put in, or slack given for any other purpose, the spring is pulled off the end of lever, and the lever worked a few times by hand, until slack enough is obtained at both trucks. In this case the left hand of the operator holds the counterweight of the upper pawl against the teeth of the left hand ratchet; the counterweight having cast to it a pawl tooth corresponding with the upper one, but which engages the oppositely set ratchet, thus reversing the movement of the swivel, and slacking off. When sufficient slack is obtained, the lever is again hung up to the spring. Should too much slack have been left, it is taken up automatically upon future applications and release of the brakes, until the fixed stroke is regained.

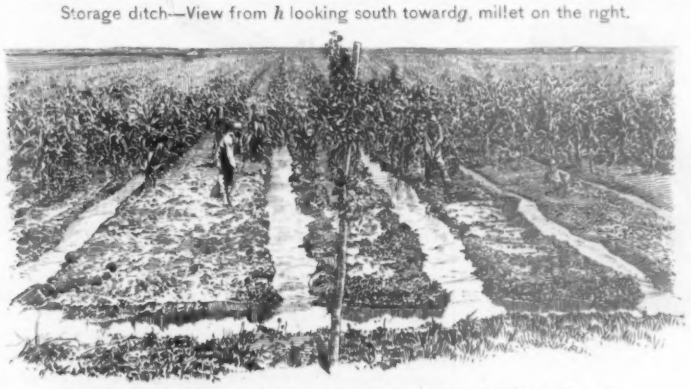
Tests of the adjuster have been going on for a year past, and have resulted in some interesting diagrams of piston travel which are instructive, especially in showing the saving in effective piston pressure, with automatic adjustment of the slack in rigging. But one pattern of apparatus is used for both passenger and freight service, varying only in the diameter of the rod to which it is attached. Apart from this, the adjusters are interchangeable in all parts, in all service.

We understand the adjuster is at present being tried in passenger service upon trains of the Philadelphia & Reading, and that trials are to be made on other roads.

Bridge, Shop and Rolling Mill Notes.

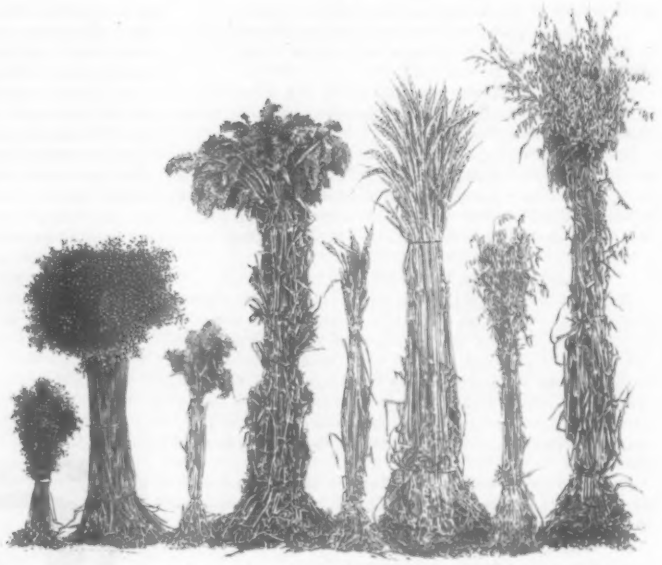
The Passaic Rolling Mill Co. has recently constructed a new templet shop at its works at Paterson, N. J. The building is 50 × 80 ft., two stories high and situated in the material yard at a sufficient distance from the rolling mill and bridge shop to obviate all danger from fire. The building rests on brick piers at about six ft. above the ground and therefore, instead of diminishing the yard room, provides an excellent storage place for light shapes and merchant iron. A portion of the building is devoted to a testing room and has accommodations for

Storage ditch—View from *h* looking south toward *g*, millet on the right.



View from *f* looking north toward *k*, showing method of irrigating corn.

View from *b* looking southwest along ditches *b a* and *b c*, showing plank water gate.



Contrast between irrigated and unirrigated wheat, oats, flax and millet.

Estimated yield per acre:		
Wheat, bushels	10 to 12	5⅜
Oats, bushels	30 to 40	10
Flax, bushels	4 to 6	20
Millet, tons	2	8

View from bank of reservoir at *a* looking northwest toward *b*, showing wheat and flax.

IRRIGATION ON CONSOLIDATED LAND & IRRIGATION COMPANY'S FARM, HURON, S. D.

The letters in the sub-titles refer to points on the general plan of farm.

inspectors representing the various railroads having contracts there.

There is also under construction an addition to the machine shop designed for the special purpose of handling and assembling the large turn-table and machinery for the McComb's dam bridge across the Harlem River, N. Y., the contract for which the Passaic Rolling Mill Co. has recently secured. The company will also go to considerable expense in enlarging its plant and purchasing new tools in order to handle this large contract. The principal tools required will probably be a large plate planer, a number of drill presses and a vertical boring mill, the latter for boring the heavy eye-bars. The work now in the shop is the Tennessee River Bridge at Knoxville, Tenn., for the Marietta & North Georgia road comprising a 275 ft. through and two 200 ft. deck, pin-connected spans, to be entirely of steel and weighing about 550 tons; also a number of spans for the Delaware, Lackawanna & Western and several short spans for Southern roads, including a 50 ft. through plate girder for the Central of Georgia.

The Pencoyd Iron Works has recently put in operation a large blooming mill with a 36-in. train. A heavy steam hammer was formerly used to bloom down ingots and the works have been badly in need of a blooming mill, both for the sake of economy and to enable them to use the hammer for other work. It has also been reported that the firm will shortly construct a universal plate mill, but as yet nothing definite has been done.

The Wellman Iron & Steel Co., of Thurlow, Pa., has recently put in operation a new, three-high, sheared plate mill which is remarkable in being one of the heaviest and most perfectly designed in the country. It will roll plates up to 136 in. wide and plates 50 to 60 ft. long and is specially adapted to rolling a high class of steel for boiler plates. No ingots are used less than 6 in. in thickness, and the steel is consequently subjected to a great amount of work. As a result there is assured a greater uniformity in the quality of the large plates and in the smaller plates into which they are cut, and also a considerable economy to the mill in shearing a large plate rather than rolling a number of small plates.

The Central Iron Works, of Harrisburg, Pa., has under construction a heavy universal mill for rolling bars and plates, and it is expected to have it in successful operation early in the summer.

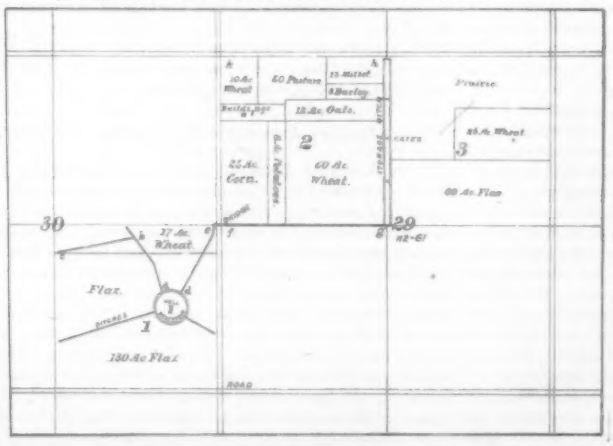
Irrigation in South Dakota.

Draw a line on the map of the United States from Boston to San Francisco. Midway between these two extremes the Missouri River skirts the southern boundary of South Dakota. Look at the strip of territory lying between the Minnesota line and the Missouri River, along the Dakota or James River, and extending northward for 425 miles, and you will see the great artesian well district of South Dakota, in which the climatic conditions which are unfavorable to uniformly prosperous agriculture are overcome by supplementing the deficiencies in the supply of water from the clouds with the waters which fall on distant regions and pass far below the surface of the ground to seek an outlet elsewhere.

In this valley, along the axis of which flows the James River, there is found underlying the surface at the depth of 500 to 1,200 ft., a stratum of saturated sand rock, from which, when tapped by borings, water rises in great quantities, not only to the surface, but far above it, creating spouting wells.

The geologists of the United States Department of Agriculture have reached the conclusion that the source of this supply is in Montana, some thousand or more miles to the westward. The sandstone strata are there turned up on edge, and being shattered to some extent and of variable hardness and porosity, and with intervening layers of clay, shale and sand, receive the surface water from a very large territory. The fissures in this rock where it underlies South Dakota are of sufficient extent to cause the head or pressure from the distant source to be retained even under conditions where the discharge is very great. The limit of capacity of discharge has not yet been even approximately discovered, so vast is the source of supply and so free its communication with the outlets artificially created.

The perpetuity of the yield from the borings which are made from the surface into this stratum of sand rock depends upon a systematic and judicious management and restriction of the flow. It is not reasonable to suppose that innumerable perforations can be made through the overlying crust and the water allowed to run to waste, and still the supply be maintained for an unlimited time. There is good reason to think, however, that with judicious management an ample supply for the irrigation of the whole of the valley of the James River can be obtained forever from this source, and it is with a view of securing this result in the most economical manner to all concerned, that the Consolidated Land & Irrigation Company of South Dakota has been created, with the object of procuring, conserving and utilizing for the benefit of the inhabitants of the state these underground waters.



Arrangement of well, reservoir and ditches, C., L. & I. Co.'s Farm, Huron, S. D.

There have been since 1882, when the first artesian well was sunk in this valley, very large sums of money expended in unsystematic and ignorantly directed efforts to procure water in this manner, and there has also been a large amount of money expended with very good results, so far as the present goes; but apparently without any efforts at restriction of wasteful discharge from the wells.

Scientifically conducted irrigation has proved of enormous value to the farmers. The yield of crops has greatly increased on

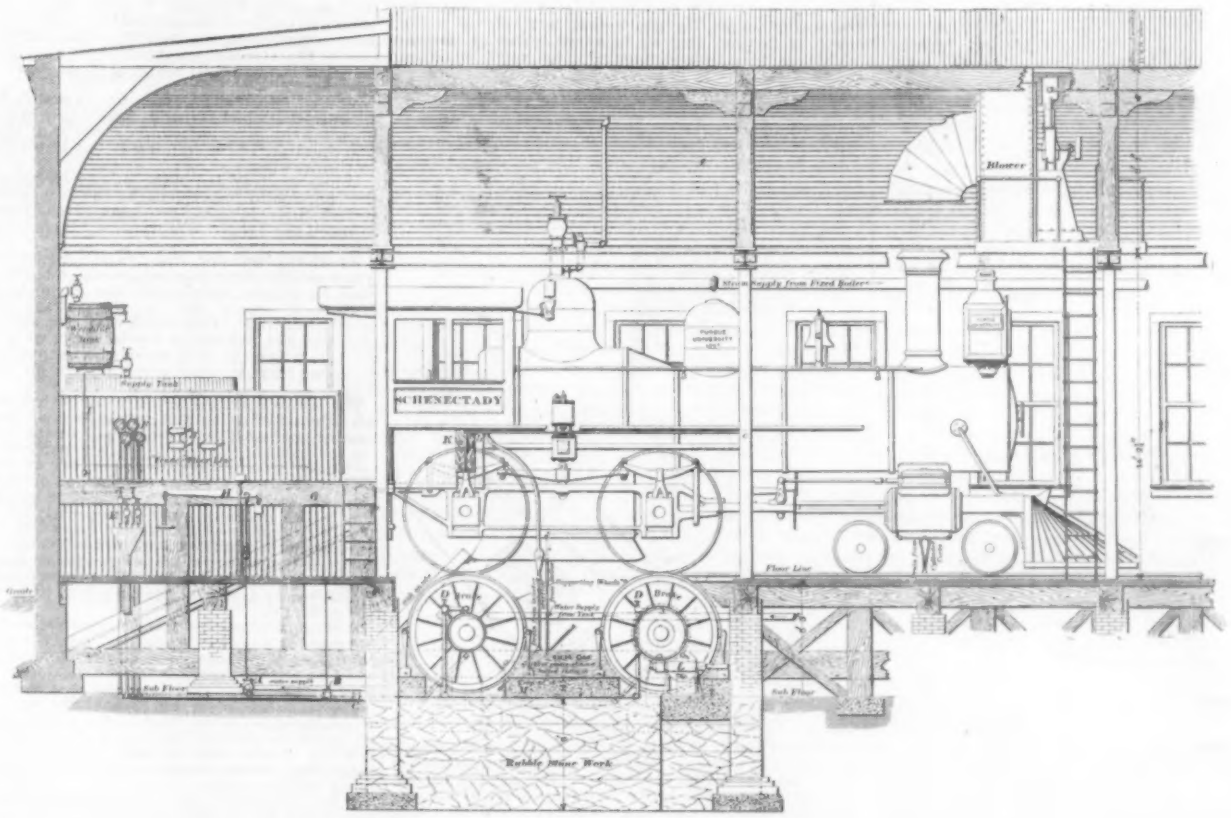


Fig. 1.

irrigated lands. The illustrations which we give were made from photographs, and show the method by which the water is applied to the land, and also the extraordinary results which have been obtained from irrigation.

The method of utilizing the water is shown on the accompanying diagram of a farm near Huron, S. D., owned and managed by the Consolidated Land & Irrigation Company.

A well 6 in. in diameter was drilled to a depth of 916 ft. at the point indicated on the diagram, and a small reservoir was constructed to receive the water which flows from the pipe at the rate of 300 gallons a minute. From this reservoir, ditches or canals were dug to the various fields which were to be irrigated, simple plank gates being provided at different points to regulate the flow of the water through the several ditches. The entire cost of the work done was about $4,500. The well was completed Nov. 15, 1890; the land was flooded during the next 10 weeks and at intervals during the growing season of the following summer. The result of the irrigation was that the yield per acre of oats, wheat, flax and millet on the irrigated ground was from four to five times as great as it was on lands in the vicinity which had not been irrigated.

The company proposes to bore wells wherever needed and to furnish water at a stipulated price per acre for the season to farmers who desire to have their lands irrigated, and it is also prepared to furnish water from wells under sufficient head to drive flour mills.

It is estimated that an annual compensation of $1.50 an acre will give the stockholders liberal dividends, and, at the same time, greatly increase the profits of the company's customers.

The development of an enterprise like this is exceedingly interesting from many points of view. The State should require from any corporation engaged in such an enterprise, complete reports as to the yield of wells taking their supply from different depths and the pressure under which those wells discharge at different seasons. It is reported that the pressure at a well in the city of Huron is diminished some ten pounds to the square inch during the winter months, but rises again in the spring. This fact alone is sufficient to show that the use of the water from this underground source should be regulated by an impartial authority so as to avoid its possible future diminution.

A Laboratory Locomotive.*

BY W. F. M. GOSS.

In the fall of 1890 the authorities of Purdue University decided to erect and equip a new building for advanced work in engineering, and soon after it was determined to purchase a locomotive of a size which should well represent its class, and to mount it in the laboratory for experimental purposes.

The plan of mounting in its inception involved (1) supporting wheels carried by shafts running in fixed bearings, to receive the locomotive drivers and to turn with them; (2) brakes which should have sufficient capacity to absorb continuously the maximum power of the locomotive, and which should be mounted on the shafts of the supporting wheels; and (3) a traction dynamometer of such form as would serve to indicate the horizontal moving force and at the same time allow but a slight horizontal motion of the engine on the supporting wheels. It was believed that a locomotive

*Presented at the San Francisco meeting, May, 1892, of the American Society of Mechanical Engineers. Briefly described in the *Railroad Gazette*, Feb. 19, 1892.

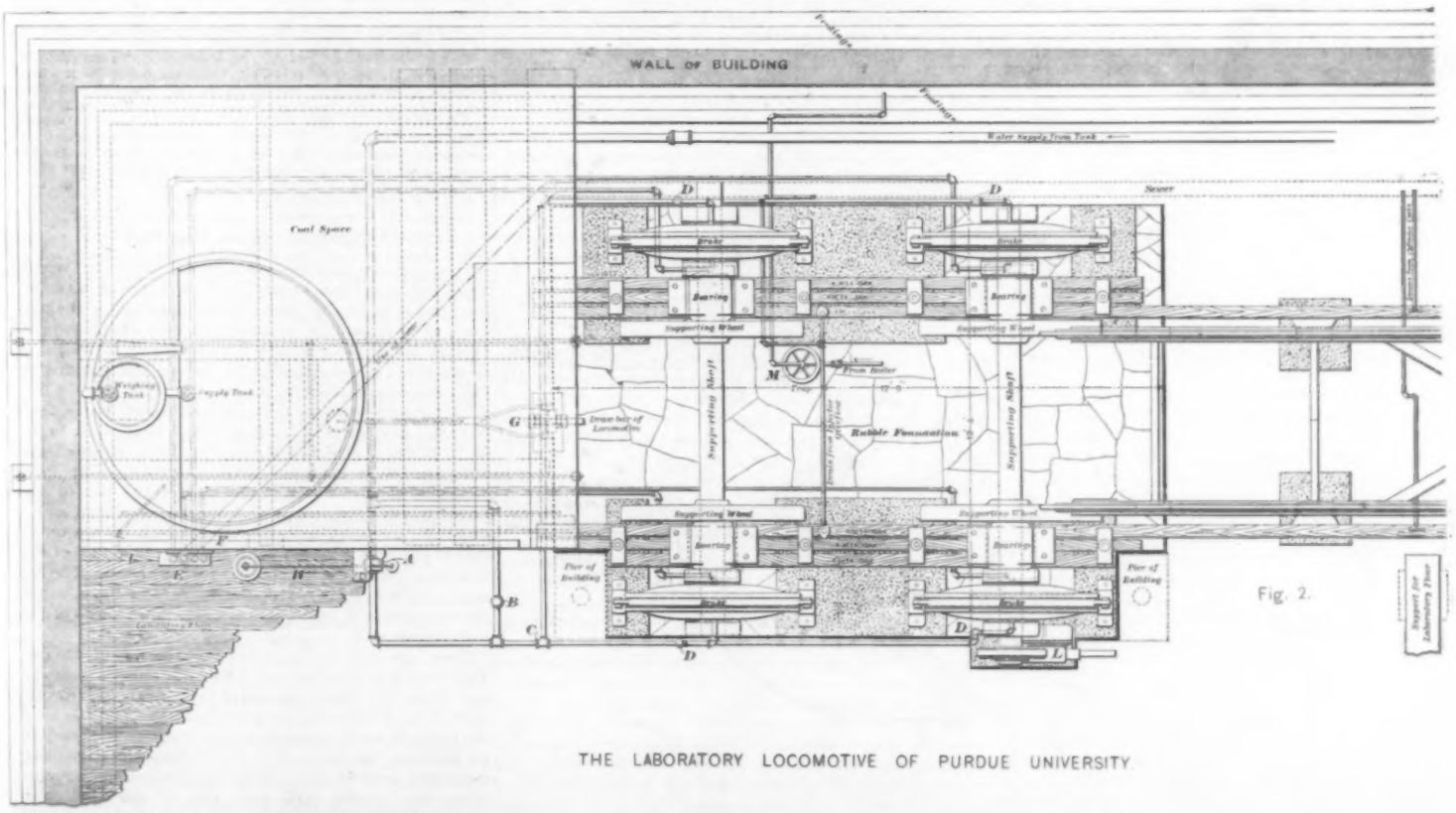


Fig. 2.

THE LABORATORY LOCOMOTIVE OF PURDUE UNIVERSITY.

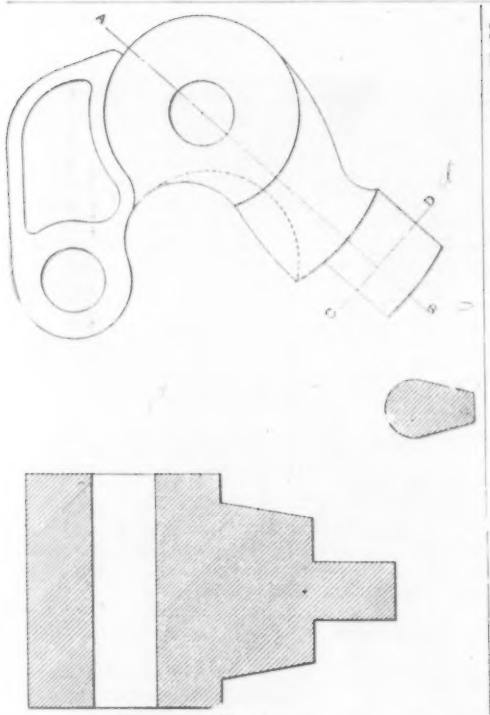


Fig. 1.

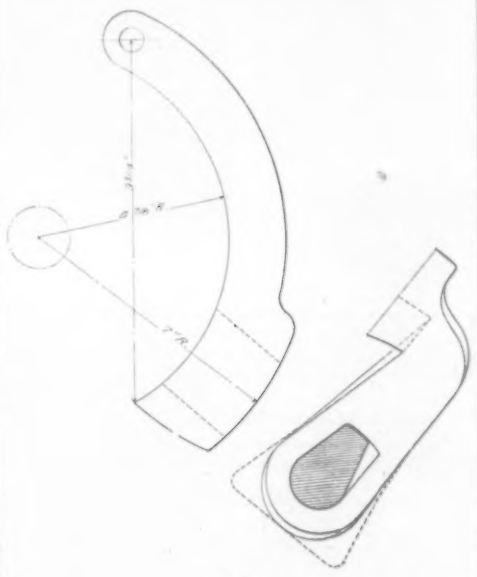


Fig. 2.

thus mounted could be run either ahead or aback under any desired load and at any speed; that while thus run, its performance could be determined with a degree of accuracy and completeness far excelling that which it is possible to secure under ordinary conditions of the road; and that the whole apparatus would be extremely valuable to students in steam engineering.

The locomotive was ordered of the Schenectady Locomotive Works, in May, 1891. It is of the eight-wheel type, with 17 × 24-in. cylinders and 63-in. drivers. Its weight is 85,000 lbs., 56,000 lbs. being on the drivers.

Fig. 1 shows a complete general view, in elevation, of the locomotive and its mounting machinery, and Fig. 2 shows in plan the mounting machinery only.

Reference to these figures will show that there is a heavy rubble foundation, capped at convenient points with cut stones projecting 10 in. above grade line. Upon these stones are placed oak timbers in two lines, each composed of three lengths, 4 × 14 in. The timbers of each line are bolted to each other and anchored to the foundation. Upon the timbers rest the bearings of the supporting shafts, which are thus given 14 in. of oak to constitute an element of elasticity between them and the foundation.

The supporting wheels are of the same diameter with the locomotive drivers, and are in other respects similar, save that the cranks and counter-weights are omitted. Their faces are turned flat, with the inside edge rounded as in a rail.

The four friction brakes which provide the load for the supporting shafts were designed on the principle developed by Prof. George I. Alden, and already described by him. The principle as developed by Professor Alden provides extensive rubbing surfaces of cast iron and copper. Excessive wear is prevented by thorough lubrication. The intensity of the brake action is controlled by water pressure, by which means the rubbing surfaces are brought into contact more or less intimate; and the heat evolved is carried off by water circulation.

There is no provision for weighing the load at the brakes, where, instead of a weighted lever, anchor rods are used to secure the case of the brakes to the foundation. The entire load shows itself at the dynamometer connected with the draw-bar of the locomotive. The water supply for the brakes is given by a 3-in. pipe. It passes first a balanced valve *A*, around which there is a by-pass controlled by valve *B*. From the tee *C* the pipe is branched for the several brakes, 2½-in. piping serving for two brakes, and 2-in. for each individual brake. Valves *D* are provided in the supply pipe for each brake, so that any one may be entirely cut out or have its action modified to any desired extent. The water from each brake is returned by a separate pipe to a point *E*, where valves are provided by which the amount of water allowed to pass each brake is regulated. The water flows from these valves in an open stream, and is finally discharged into the sewer. The water pressure within each brake is indicated by one of the four gauges at *F* (fig. 1).

The balanced valve *A* has its spindle connected with one of the levers of the dynamometer in such a way that its position is controlled by the pull or if backing, by the push exerted by the locomotives. Thus, suppose the locomotive is in motion and the outlet valves at *E* adjusted to allow the passage of water enough to keep down the temperature of the brakes, and suppose the pull of the locomotive is such as will bring the weighted lever of the dynamometer to its mid-position, then there will be a definite opening of the balanced valve, and a definite water pressure within the brakes will result. If, now, for any reason the weighted lever falls, there will be a corresponding increase in the opening of the balanced valve, and, hence, an increase of water pressure within the brakes. The greater pressure will result in greater resistance to the moving of the supporting wheels, and, hence, in a stronger pull of the locomotive on the dynamometer, and this increased pull will tend to lift the weighted lever again. Similarly, if for any reason the pull of the locomotive is sufficient to raise the lever beyond its central position, the balanced valve will respond by reducing the water pressure within the brakes; the tractive force of the engine will decrease and the dynamometer lever will fall. When, therefore, it is desired to increase the load on the locomotive it is necessary only to place the additional weight upon the lever of the dynamometer, and the corresponding increase in the load is furnished automatically by the brakes. By a proper adjustment of the by-pass valve *B* the lever may be made to stand exactly in its central position.

The traction dynamometer is made up of a system of levers. The first lever in the system, shown by dotted outline at *G* in figs. 1 and 2 has a direct connection with the locomotive draw-bar. The last lever, shown at *H*, carries an ordinary weight-holder. The whole arrangement is such that, whether the engine moves ahead or aback, the stress is transmitted by the draw-bar and its value is shown by the weight necessary to balance the lever *H*.

The dynamometer levers are carried by a heavy framework, which is well secured to the locomotive foundation and to surrounding parts of the building. The character of the framing is but imperfectly shown by the drawings.

While the draw-bar is the only active agent by which the horizontal movement of the locomotive is controlled, there is ample provision of chains and buffers to check any excessive movement which may chance to occur.

Above the levers of the dynamometer a floor is laid which chiefly serves the purposes of a tender. It gives room for a tank from which the locomotive injectors draw their supply and for the storage of a limited quantity of coal. Connected with the water tank is a glass gauge *I*, and above the tank is a weighing barrel through which the tank receives its supply. Scales for weighing fuel are also given a place on the "tender floor."

The three counters at *J* are connected, respectively, with the rear driving axle and to each of the two supporting shafts. These give a ready means for dererming the speed of the engine, and the per cent of slip between the drivers and their supporting wheels.

The tell tale at *K* shows the position of the locomotive relative to the supporting wheels. The board *a* is fastened to the locomotive and consequently moves with it; the rod *b* is connected at one end to an iron column as a fixed point, and at the other end to the pointer *d*. This pointer is pivoted to the board *a* at *e*, so that any backward or forward movement of the locomotive is greatly multiplied by a similar movement of the lower end of the pointer *d*.

A tangent wheel and screw are provided at *L* for the purpose of turning by hand the forward supporting shaft, and hence the engine, whenever it may be desired to do so, as, for example, for convenience in valve setting. When not in use, the screw may be disengaged.

The truck-wheels of the engine rest upon light rails which are fixed at the level of the laboratory floor and extend in front of the engine a distance sufficient to allow the whole machine to be moved forward off the supporting wheels, whenever the latter may need to be taken out for repairs.

A Sturtevant 4½ × 6¾ steam blower located above the engine but not in pipe connection with it, removes from the room everything that is given out of the locomotive stack, without changing, materially, the draft conditions under which the locomotive is worked.

The cylinder-cocks and the overflow pipes from the injectors, are all in loose connection with the sewer. The discharge from the overflow pipes may be directed into weighing barrels.

The boiler is in pipe connection with the fixed boiler which supplies steam for the general purposes of the laboratory, so that the locomotive may be used to supply steam to other apparatus, or the fixed boiler may be used to supply the locomotive. In the latter case the locomotive boiler is drained by means of the steam trap *M*, which by keeping the boiler free from water, allows all its parts to be at the same temperature. The greater convenience attending the use of the fixed boiler makes its use desirable when problems are studied which affect only the mechanism of the engine.

The locomotive drivers are 63 in. in diameter, and the sum of the moments about the two driving axles when the engine is exerting a tractive force of 16,000 lbs. (assumed to be maximum), is therefore $16{,}000 \frac{63}{2 \times 12} = 42{,}000$ foot pounds, which, since the supporting wheels are of the same diameter, with the drivers, is the moment under which the brakes on the supporting shaft must work. Each of the four brakes, therefore, must be capable of acting under a moment of 10,500 foot pounds. The disc of the brakes is 56 in. in diameter. The area is effective contact with the copper plates on either side is represented by an annular surface having its outer radius equal to 28 in., and its inner radius equal to 10 in. These dimensions, in connection with the assumed co. efficient of friction and the assumed maximum water pressure, give a calculated moment slightly in excess of the required 10,500 foot pounds.

The matter of subjecting the locomotive to conditions similar to those of an inclined track has not been considered as in any way essential to the present scheme, and no complications have been added to the mounting mechanism with this end in view. It would appear, however, if the point of contact between each driver and its supporting wheel be such as to make their common tangents represent the desired grade, that then the conditions of gradient would be met. The nuts on the draw-bar readily allow such an adjustment.

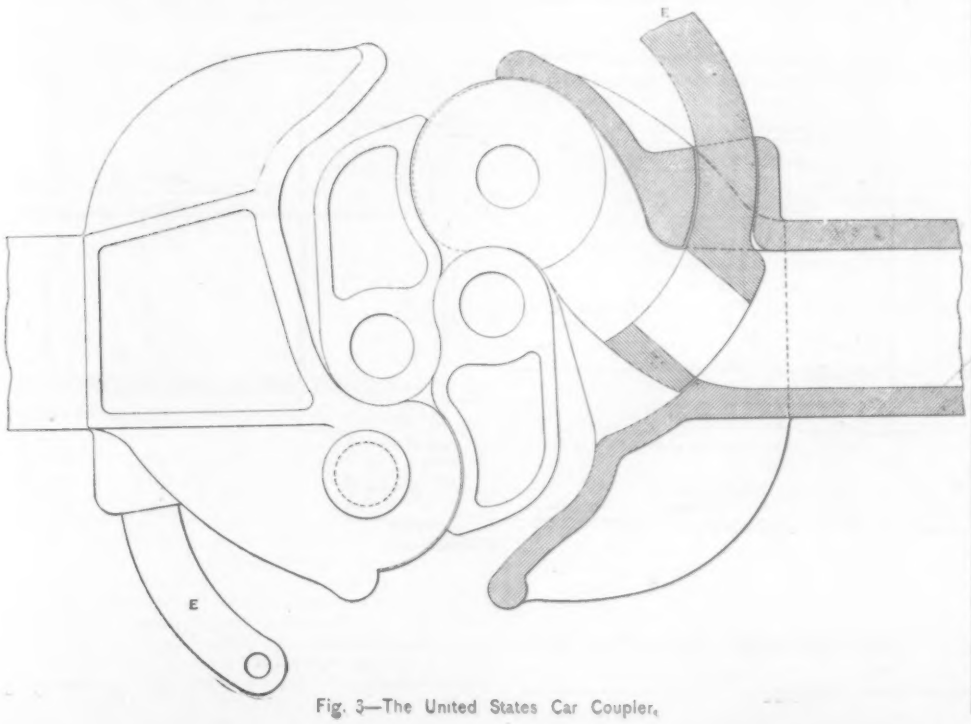


Fig. 3—The United States Car Coupler.

The United States Coupler.

This coupler was designed by Mr. Dowling whose name has long been known as an inventor of car couplers, and who retains nearly a half interest in the patents. The remaining interest has been transferred to two or three persons, and Mr. Charles H. Newkirk, of Newark, O., has the agency for selling the coupler or the right to manufacture it.

The chief peculiarity is in the locking device. Otherwise the coupler is of familiar form. It is made to the M. C. B. lines. The tail of the knuckle is made of the form shown in plan and section in fig. 1. The lock, which is shown in fig. 2, slips over the tail of the knuckle and slides in a slot in the drawhead as the knuckle is opened and closed. A notch on the under side of the lock engages with the outer surface of the drawhead, dropping into position when closed. The relative position of the parts may be seen in fig. 3, which shows a plan and horizontal section. Two views of the lock appear at *E*.

From the lock a lever extends to the side of the car. This lever is pivoted in such a way that depressing the end of the lever raises the end of the lock and disengages it from the drawhead; then by pushing in on the lever the knuckle can be opened, so that it is not necessary to go between the cars. It is a very simple matter to arrange this lever in such a way as to unlock the knuckle in case the coupler pulls out. One of the carriers or hangers for the unlocking lever is made to slope upward

and forward, and when the coupler is pulled out by the breaking of the tail-bolt or other accident, the unlocking lever is not only moved forward with the coupler, but its inner end is raised by sliding up the inclined plane of the hanger. This lifts the lock sufficiently to disengage it and allow the knuckle to open. We understand that a number of these couplers have been tried in service with good results.

Automatic Knife Grinding Machine.

This new improved automatic knife grinding machine is designed for grinding all kinds of planer knives, both short and long. The tendency of the times is toward the use of wide planers, and woodworkers find now that it is possible for the widest planers to do the best of work, something hardly thought possible in the past. The planing of built up stuff of extra width is no longer an impossibility.

The great object of this machine is to improve the running of all planers by keeping the knives and the cylinders in perfect balance. The great advantage of making it perfectly automatic is to enable the operator of the machine to have one set of knives always ground while the planer is in operation. It can be set so as to grind any depth of cut wanted, and will take care of itself when once set. It will grind any length up to 42 in., grinding slightly concave, thus enabling the operator to whet the knives twice as often before regrinding as with the old plan.

The frame is cast all in one piece, and has a good floor base which does not take up much room; it is entirely self-contained, as the countershaft and the driving works of the carriage are all on the one frame. The carriage has a steady traverse movement forward and backward. The carriage also has a horizontal motion, to or from the grinding wheel, to allow for the wearing away of the wheel; the horizontal movement being adjusted by a hand wheel and weighted lever shown in front of the machine. The mandrel is of cast steel, running in self-oiling boxes. The clamp or jaws which hold the knife on the carriage can be thrown clear back so as to allow a very neat and quick arrangement for setting the knife in the jaws. Further information may be had from the introducers and builders, The Egan Company. Cincinnati, O.

The New York Rapid Transit Commission.

At the session of the Supreme Court Commission held May 11, at 4.30 p. m., Abner Bartlett, the business agent of the Astor estate, was examined. The witness was apparently over 70 years of age, and stated that he had managed the real estate of the Astor family for a great many years. That family, he stated, had not been obstructionists, but had always acquiesced in improvements tending to develop the growth of the city and the enhancement of the value of real estate. His opinion was that the time was not at hand for the construction of an underground road under Broadway. He thought that the demands for rapid transit were sufficiently supplied by the present elevated roads. As regards an underground road on Broadway, he thought that it would not be practicable with the present sewerage system to build a road which would not be objectionable. He did not look upon an underground road as desirable at any rate, and Broadway ought to be left alone for a while. He did not believe capital could be found to construct a system of rapid transit in opposition to the system now existing.

On cross-examination by Mr. Bowers he stated that he never traveled on the elevated railroad if he could help it; he always rides either in the horse cars or his own wagon. He helped to pay for the elevator at the Manhattan Railway station at 116th street and Eighth avenue, considering that to be a desirable improvement. He believed that the elevated system could be improved, but did not know how. He had not asked the opinion of experts with reference to the proposed underground road because he thought that the elevated railroads furnished sufficient facilities now and that the trains are rapid enough. He expressed some dissatisfaction with what he termed "Mr. Bowers' tortuous questions," and the counsel allowed him to retire.

In reply to some desultory remarks by one of those present, the Chairman stated that he must call the attention of those who wished to say anything that the only question before the Commission was whether an underground road on Broadway on the plans proposed by the Rapid Transit Commissioners was desirable, and he must request speakers to confine themselves to that subject.

R. W. Townsend, one of the directors and the counsel for the Importers' & Traders' Bank, No. 247 Broadway, was the next witness. He stated that his bank was opposed to an underground road as being more of a nuisance than a benefit. The elevated road is crowded, to be sure, but at all events the passengers can get a breath of fresh air and are not afraid of being poisoned, as they would be by the gases and foul air of an underground road, which would be, at any rate, dirty, dark and unhealthy. He considered the present means of transit sufficient.

In reply to a question from Mr. Bowers, he stated that he had traveled on the elevated roads at all hours of the day, and sometimes found them crowded. Generally he went up town at an earlier hour than the heaviest travel occurred, and always succeeded in getting a seat. His impression was that the construction of a road under Broadway would endanger property on that street.

Samuel E. Goodwin, who had been engaged in house moving and the shoring of buildings for 40 years, stated that he was well acquainted with the soil under and in the vicinity of Broadway and considered it impracticable to build a tunnel in the manner proposed by the Rapid Transit Commissioners. Most of the front walls on Broadway are supported on piers and about one-half of the buildings along the street have sub-cellars. To excavate the sand below from 7 to 10 ft. below the surface of the street and from curb to curb would make it necessary to shore up the fronts of nearly all the buildings along the street, placing the supports at about the level of the first story and removing and rebuilding all below that line. He would not undertake to build such a tunnel at any price, but would like to see it attempted as it would bring him a good deal of business. The disadvantage of counsel asking very long questions was illustrated during the examination of this witness. At the end of a very involved and voluminous dissertation purporting to be a question as to the possibility of excavating a tunnel partly in earth and partly in rock, the witness said: "I didn't notice what you were saying just now, but I think if they went down deep enough to get into solid rock entirely there would be no danger." In reply to a question as to the time necessary for the work, the witness said: "With men enough, the shoring of all buildings could be done in a month, but it would more likely take three years."

On cross-examination the witness stated that he had shored up from 50 to 100 buildings on Broadway. He shored up the buildings and other men built the walls. In most cases it is necessary to shore up the building if the excavation is within 4 to 7 ft. of it. At the post-office excavation very fine sand was encountered, and it was necessary to shore the cut very strongly, as they feared that a settlement would cause the Astor House, on the opposite side of Broadway, to fall.

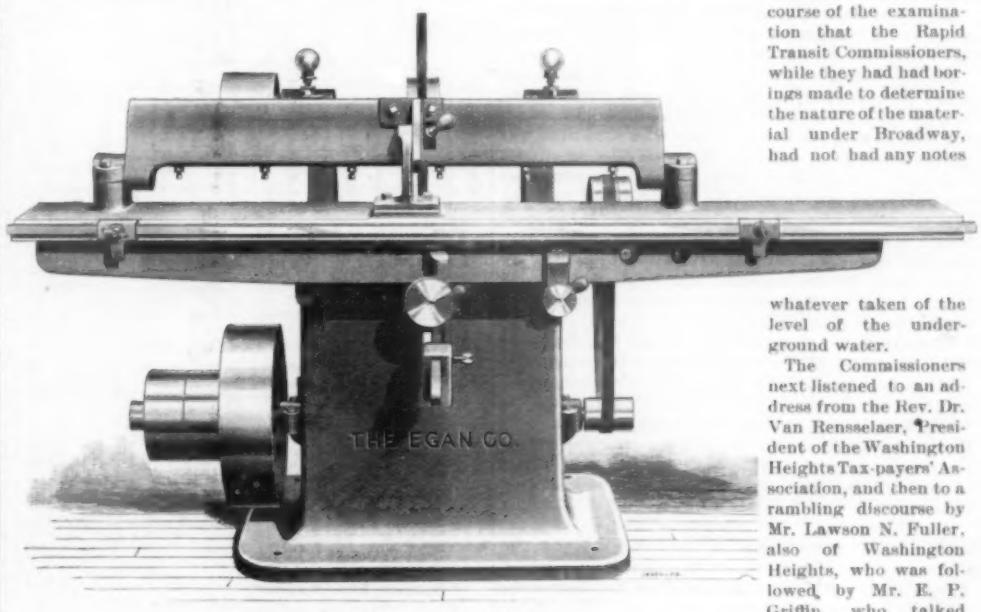
The next witness was William H. Morrell, who read a very diffuse paper objecting to everything generally and not descending to details at all. Neither the Commissioners nor counsel considered it necessary to ask him any questions.

At the meeting on May 12 the first witness who was examined by the counsel for the Western Union Telegraph Co. was James Baker Smith, a builder of 35 years' experience, who had built the Western Union and Consolidated Exchange buildings, the buildings 549-551 Broadway, the Welles Building, and excavated the foundations for the Post Office and Produce Exchange. He was well acquainted with the soil of Broadway. Below Union Square the sub-soil is sand, coarse in the upper portion of the section, and below Fulton street very fine. At a depth of from 10 to 12 ft. below the surface there would probably be no stones to encounter, but at the depth at which it was proposed to build the roof of the tunnel, he thought that there were in a good many places stones in the filling of trenches and various excavations which had been made in the street, and that it would be impossible to drive poling boards or needles along the proposed roof of the tunnel without encountering bowlders and cobble stones, and in removing them it would be impossible to prevent the superincumbent sand from running in and causing a settlement in the surface of the street. The water pipes also were in an unsafe condition, and any settlement in them would cause leakage which would follow the tunnel and wash out the sand so that the street would settle. Among the large buildings which would be endangered by the excavation, he mentioned the Western Union Telegraph Co.'s building and the U. S. Post Office. All along Broadway a good deal of underground water was found at a depth of from 12 to 16 ft., and below Cedar street at a depth of from 10 to 12 ft. He knew of instances of settlement of buildings having occurred in consequence of the washing out of sand in excavations a quarter of a mile from the cut. The foundation of Trinity Church, which extends only 9 ft. below the surface of the street, he thought would be endangered. He knew that running water had been encountered in gravel and fine sand at the building opposite the Equitable Insurance Co.'s building. No water was encountered at the Western Union Telegraph Co.'s building at Dey street at 22 ft. below the surface. There was fine sand under Broadway, and a good deal of difficulty was encountered in shoring the excavation, and the pavement of Broadway had settled to a considerable extent during the construction. At the Consolidated Exchange, he had excavated 13 ft. below the foundation of the adjacent building for about 20 ft. below Broadway, and encountered water in the bottom of the cut.

On Mr. Bowers asking him if he had repaired damages to adjacent buildings and made them as good as before, the witness replied that he had tried to make the owners believe that he had.

The witness was a little hard of hearing, and whenever the counsel for the Commissioners asked very long questions addressed partly to the audience, turning his head so as to not speak directly to the witness, Mr. Smith could not hear what he said.

It came out in the course of the examination that the Rapid Transit Commissioners, while they had had borings made to determine the nature of the material under Broadway, had not had any notes whatever taken of the level of the underground water.



Automatic Knife Grinding Machine.

The Commissioners next listened to an address from the Rev. Dr. Van Rensselaer, President of the Washington Heights Tax-payers' Association, and then to a rambling discourse by Mr. Lawson N. Fuller, also of Washington Heights, who was followed by Mr. E. P. Griffin, who talked wildly, devoting himself principally to abusing the testimony given by Mr. W. E. Worthen. The Commission adjourned until Tuesday, May 17, at 3 p. m.

The American Locomotives in New South Wales.

Last week we announced that Mr. Eddy, Chief Commissioner of Railways for the Colony of New South Wales, was to undergo investigation concerning among other things, alleged irregularities in the purchase of locomotives from English builders. It appears that poor Mr. Eddy has also to catch it on the other side, for he has been investigated for his purchase of locomotives from the United States. This latter investigation has been instigated by Mr. Hoyle, Member of Parliament, representing the labor element. The Hoyle Commission consists of Mr. F. E. Rogers, Q. C. (President), Prof. Warren, M. I. C. E., and Mr. A. Brown, J. P.

At the opening session the charges made by Mr. Hoyle were read as follows: "That the Baldwin passenger engines and the consolidation goods engines were faulty in design, that certain parts of the axles of the bogies and tenders were defective and dangerous, that gross neglect had been shown in allowing them to run before the defective parts were removed, that the engines were not necessary to the traffic; that the couplings and drawgear were weak, and that in consequence of the great weight of the engines the safety of the permanent way was likely to be endangered." The charge that the engines were unnecessary was disallowed as being beyond the scope of the inquiry.

Mr. Hoyle asserted that there were engines in use quite as powerful as the Baldwin engines before they were ordered. Mr. Rogers did not see how that had anything to do with the inquiry. Mr. Hoyle then went on with the charge that the Baldwin passenger and freight engines had defective axles in the trucks; moreover, that the weight of these engines was such as to endanger the safety of the permanent way, the standard rail of New South Wales being 75 lbs., and these engines requiring 80 lbs. When Mr. Hoyle was asked to prove these matters he urged that the Commissioners should first bring forward their rebuttal evidence. that, however, was not allowed, and he proceeded with his demonstration.

His first testimony was to the effect that the station

platforms has been set back to give room for the Baldwin engines to pass, but he could bring forward no evidence of this fact, nor any figures whatever giving the dimensions of platforms or engine clearances.

He then asserted that the safety of the draw-gear was endangered by the weight of the Baldwin engines, in which he contended he was supported by Mr. D. H. Neale, in the report prepared by that gentlemen for the Commissioners. When he was asked what that had to do with the matter, he said that he proposed to show that the Baldwin engines are too heavy for the Colonial lines, and that the draft gear first used on the engines had been broken, and stronger rigging had to be imported. Mr. Rogers suggested that it was common sense that more powerful engines would require stronger draft gear. Mr. Hoyle could not enumerate any cases of breaking of the draft rigging, never having seen any, although he had seen the rigging after it had been broken. Concerning defective axles he said, that on or about Oct. 29 last, there had been an account published of an accident to an express train coming into the Sidney station. From the report it appeared that the axle broke, and that "had it not been for the cow-catcher, the engine would have fallen over on its side." When questioned as to how he knew this, he said that he only knew it from the newspaper report.

Mr. Eddy admitted there had been a broken axle, and that the other truck axles had been replaced at the cost of the Baldwin Works.

Mr. Hoyle insisted that there had been gross negligence in the fact not being made known earlier that the axles were of iron and not of steel.

Mr. Hoyle then charged that the pistons and cross-heads were too heavy; that the axle boxes were wearing into the boss of the wheel; that the process by which the wheels were made (iron wheels with steel tires) was new and defective, flaws having been discovered. He had seen one of these flaws but did not remember the number of the engine. He also proposed to prove that the tubes were working loose because of the great length of the boilers, also to show that the boilers were defective and leaky, and that new reversing gears were being made for the engines. Mr. Hoyle further held that the weight of the engines was not sufficient to enable the wheels to grip the rails!

On cross examination, it appears that Mr. Hoyle had been an employé of the State Railway Department 15 years as a signalman or in connection with the signaling department. He would not say for certain that station platforms had been moved on account of the engines. He was not aware that a carriage was running on the line requiring greater clearance than these engines, and he was not aware that engines of the same weight were running in the United States on 67-lb. rails.

Mr. Eddy testified that the first of the Baldwin engines was put under steam in July, 1891, and that the alterations in station platforms were not made in consequence of the use of these engines. They had been made simply to conform to standards which the Commissioners had introduced since they came into office.

Mr. D. H. Neale stated that he was Mechanical Engineer on the staff of the Commissioners, and that it was his duty to advise the Commissioners on any matter that they referred to him. In the matter of the Baldwin engines he had advised the Commissioners that the importation of these engines was an immediate necessity. His experience with similar engines had been in America where he had seen them, and talked much with officers of railroads. The Baltimore & Ohio engines were taken as a model with certain improvements; among other things the weight on driving wheels was reduced. In the specifications it was provided that either iron or steel axles might be used. He was not aware that any defects existed in the wheels as they came out, and as a matter of fact they were much safer than ordinary wheels.

He believed that on one occasion a journal had been twisted off, but that was not necessarily a serious accident. Only about one per cent. of broken axles caused serious results. For four years that he was chief draftsman on the Great Eastern Railway of England about 30 or 40 broken axles passed through his hands a year, but not one passenger was injured by accidents that they caused.

Tests were made after the breaking of the Baldwin axle and it was found that the axles were not so good iron as they should be. They had been replaced by steel axles which were larger than the iron one broken. Instruction had been given to the Baldwin Company to take special care of the lubrication, but the journals had run hot, why, he did not know. It was a hot journal that caused the accident quoted.

It was true that the original draw-gear sent out was not strong enough, but this had been replaced.

Mr. Hoyle asked if it was true that the cross-heads and guides had worn, and that brass liners had been put in. Mr. Neale said that it was not true to his knowledge. In reply to further questions, he said that even if this had been done, he should not consider it an evidence of defective design, considering the mileage the engines had run. This closed the inquiry to the last advices that we have received.

The International Railroad Congress.

It is announced that the date of the session of this Congress, which is to be held at St. Petersburg, has been fixed by the Czar from Aug. 20 to Sept. 3.

Effect of Temperature on the Tensile Strength and Ductility of Metals.

BY H. WADE HIBBARD.

(*Concluded from page 324.*)

Very thorough experiments upon the behavior of mild steel at high temperatures were made in Germany in 1886. An extract from the report appears in the *Iron Age* for December 4, 1890, page 990. A commission was appointed from the Society of German Iron Manufacturers and the Society for the Advancement of Industries. Half the expense was borne by the government.

Three classes of mild steel were tried, having an ordinary maximum tensile strength of 54,600, 62,100 and 66,830 lbs. per square inch. The hardening element was as much as possible carbon, other elements being kept low and as uniform as possible. The principal results may be seen in the following table. I may explain that up to the "elastic limit" the load and stretch are proportional—double the load and the stretch will double. The "yield point" is where the metal suddenly gives way and "flows" in a very marked degree. The "modulus of elasticity at temperature of room" was obtained by loading and unloading each piece up to 600 lbs. per square inch.

MILD STEEL.—TABLE II.

Class of metal.	Modulus of elasticity at temperature of room.	At experimental temperatures. Temp. Fahr.	Modulus of elasticity.	Load in lbs. per sq. in. at elastic limit.	Load at yield point.	Maximum load.	At fracture. Per cent. elongation in 8 in.	Per cent. contraction of area.
1.	30,746,000	— 4	30,740,000	17,493	35,120	58,480	31.9	55.8
	29,430,000	+ 68	29,430,000	23,460	31,280	54,600	30.4	58.6
	28,860,000	212	28,280,000	20,760	28,449	55,630	14.1	50.9
	29,750,000	392	27,720,000	25,730	28,290	71,580	15.8	44.5
	29,430,000	572	26,730,000	14,640	22,180	68,410	20.	22.9
	29,150,000	752	25,450,000	9,243	16,060	48,490	35.	57.5
	30,000,000	932	21,470,000	5,972	.....	27,440	50.3	79.6
	29,860,000	1,112	19,050,000	2,844	4,550	15,210	76.7	90.5
2.	29,700,000	— 4	29,860,000	22,466	38,100	66,400	28.8	48.7
	29,430,000	+ 68	29,860,000	24,310	36,970	62,100	28.9	48.7
	29,400,000	212	29,430,000	23,740	34,940	63,940	15.6	43.7
	29,430,000	392	27,720,000	26,870	32,560	77,920	14.8	33.2
	29,860,000	572	27,560,000	18,060	.....	75,220	22.6	27.6
	30,000,000	752	26,020,000	15,780	20,190	61,420	29.5	50.6
	29,980,000	932	21,600,000	.....	.....	32,120	14.9	79.5
	29,700,000	1,112	17,000,000	.....	.....	15,990	67.3	96.
3.	30,000,000	— 4	29,860,000	25,160	40,520	71,240	26.9	57.5
	29,570,000	+ 68	29,000,000	26,680	41,000	66,830	28.6	61.5
	29,000,000	212	29,000,000	31,140	37,110	66,400	18.6	55.4
	29,700,000	392	27,290,000	25,000	36,260	81,000	12.9	36.3
	30,140,000	572	27,160,000	23,880	30,280	63,560	5.1	8.5
	29,860,000	752	26,000,000	.....	22,320	61,400	30.9	44.5
	30,000,000	932	21,890,000	.....	17,060	37,800	44.8	74.1
	29,860,000	1,112	20,470,000	.....	.....	19,850	56.9	89.3

A study of the curves below, plotted from the data, will give a clearer understanding of the behavior of the three metals.

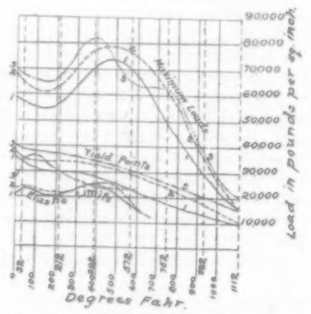


Fig. 3—Strength; from Table 11.

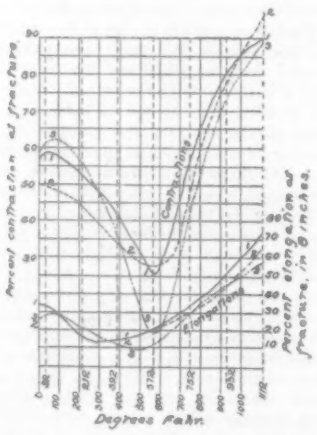


Fig. 4—Ductility; from Table 11.

It will be noticed that the elastic strengths follow the same law as the maximum strengths, and both are equal to or above the cold strength past 500 degrees. Curve 1, having an ordinary strength of 54,600 lbs. per sq. in., is the nearest to best American railroad practice for boiler steel. This does not lose its ordinary strength until heated up to 700 degrees; and in retaining ductility it is far superior to 3, the 67,000-lb. steel, and about equal to 2.

At the Watertown Arsenal, James E. Howard, within a few years, made a series of tensile tests on iron and steel at temperatures up to 2,000 degrees. Three irons at about 500 degrees show an average gain in strength over the cold iron of 20 per cent., the metal weakening thereafter at higher temperatures. For mild steels the average gain at about 460 degrees was 26 per cent. For hard steels the gain at 500 degrees was about 9 per cent. These are the temperatures at which the respective metals showed maximum strength. His tests on riveted joints of boiler plate up to 700 degrees, followed the same law as for solid test pieces.

Among "pocket books" Jones & Laughlin's, Pittsburgh, 1890, quotes from the Franklin Institute experiments.

Haswell's, 1890, has the following upon wrought iron:

"Effect of Temperature.—Tensile strength at different temperatures is as follows:

Temperature, Fahr.	60	114	212	259	270	325	435
Variation of strength	1	1.14	1.2	1.32	1.35	1.41	1.4"

New Jersey Steel & Iron Co.'s 1889 pocket book has the following:

"Wrought iron increases in tensile strength with increase of temperature up to 600 and 900 Fahr., depending on the purity of the iron; pure wrought iron reaching its maximum strength at a higher temperature than impure iron or than steel, and soft steel at a higher temperature than hard. Beyond the temperature of its maximum strength it weakens rapidly, and at a dull red heat has only about half its tensile strength at ordinary temperatures."

A criticism might be made upon these experiments, that no trials were made with test pieces heated by steam. It is possible that some such may have been made, but not to the writer's knowledge. The mechanical difficulties attending the application of high pressure steam to test pieces in the testing machine might have prevented its trial. It may, however, be regarded as doubtful whether steam heat would have a different immediate effect upon metal from the heat as applied. But, in addition, pieces of the metals should have been exposed to the continued action of steam of different temperatures to determine the varying rates of corrosion. We know that in boilers the corrosive effect of hot steam and water has shown some remarkable effects in pitting. Experiments upon the action of very hot steam upon glass bulbs and tubes show that it acts as a powerful corrosive. Furthermore, in making hydrogen gas by passing steam through hot iron shavings, the hotter the iron the faster does it set free the hydrogen from the steam by combining with its oxygen and becoming itself oxidized or corroded. Therefore greatly increased steam pressures would presumably cause greater corrosion and pitting in boilers, necessitating the use of purer water and more thorough inspection of boilers in use.

BLUE SHORTNESS.

That iron and steel are brittle when heated to a blue color is shown by the following data. It was first noted in the Franklin Institute report of 1837 as follows: "At elevated temperatures, before the diminution of strength has begun to be felt, the diminution of area of fracture is often much less than when cold." In one bar the area of fracture at 577 degrees was to the same at ordinary temperature as 3 to 2. "In this and similar cases the fractures at high temperatures were observed to take place suddenly. The fractured surfaces were smooth and flat, and looked altogether different from cold fractures."

Valton (see *Bulletin Iron and Steel Association*, February, 1877) also noted it. He tried a great variety of steel and wrought and cast irons with the result that all were deficient in ductility at a blue heat, which he put at from 577 to 752 degrees. He states that his workers in sheet iron refrain from blows while it is blue, to resume when cooled a little more.

James E. Howard says that at the temperature of deep straw to purple bronze, 400 to 600 degrees, there are periods of rigidity, differing in temperature for different bars.

The German experiments in Table 11 confirm the "blue shortness" at this low temperature with the quoted words: "Between 200 and 300 degrees Centigrade," equal to 392 and 572 degrees Fahr., "is the 'blue heat,' where is increased strength, decreased elongation and less contraction. It is less ductile, fracture often takes place without contraction, and the metal is in a measure brittle." The curves in fig. 4 show how this brittleness ranges.

There are some hints of this blue shortness in other tests. Curve 2, fig. 2, shows a minimum elongation at 300 degrees in raw iron; and at 400 degrees in reworked iron, Curve 1, though not so marked. The steel loses half its ductility as early as 300 degrees. Curves 8, 9 and 10 show no marked brittleness at 572 degrees, though they may have been so somewhat before that temperature, where no trials were made. Curve 11, a harder steel, shows a slight minimum at 572 degrees.

A report upon the use of low steels in bridge construction, presented by Geo. C. Mehrtens to the Prussian Minister of Public Works, appears in the *Engineering and Mining Journal* of Dec. 12, 1891. In it are some

tests on the blue shortness of Thomas or basic Bessemer steel to determine the effect of rough treatment of the plates at the temperature of 572 degrees Fahr.

In his table (No. 12 below) the elongation and resilience of Group 1 should be compared with Group 2, stretched at a blue heat, and Group 3, hammered at a blue heat; also Group 4, hammered and bent cold, with Group 5 having the same treatment at 572 degrees, showing in a very marked degree the effect of working at this temperature. The first half of Group 6 is to be compared with the second half.

Group 1 was tested at ordinary temperature.

Group 2 was heated to 572 degrees, then stretched at this temperature, removed from testing machine and broken cold, showing a fall of "relative resilience" from 108.8 to 88.4, the loss being 19 per cent. of the former figure. The elongation fell from an average of 27 to an average of 18.3.

Group 3, heated to 572 degrees, peened by numerous blows of a hand hammer, restraightened and flattened, cooled, and then broken in testing machine, shows a resilience fallen to 68.8, being a loss of 37 per cent. of the cold resilience. The elongation drops to 15.3 per cent.

Group 4, bent *cold* to a right angle by hammer blows, straightened and tested, shows 82.8 resilience, being a loss of only 24 per cent. In elongation the figure is 20.5 per cent., as against 27 per cent. when tested ordinarily in Group 1.

Group 5, heated to 572 degrees, bent to a right angle by hammer blows, straightened, then cooled and tested, showed 26.6 resilience and 6.2 elongation, each being less than one third of that in the preceding group. The lost resilience is 76 per cent. of the ordinary resilience of Group 1, or more than three times the loss of Group 4.

Group 6. The pieces were bent by hammer blows 90 degrees, then reversed to 90 degrees in the opposite direction, and repeated, counting the number of times until failure. This was done both cold and hot.

This, and the results in Group 5, indicate that it is three times as harmful to hammer and bend this steel when at a blue heat as when cold. The author adds that "rough treatment or working at a blue heat must be prohibited. Such treatment cannot be borne by wrought iron, although not suffering as much as low steel." It is well to add that the behavior of Thomas steel is much more important to the German than to the American; for while it is a very large product there, in this country there is but one company that produces it.

THOMAS STEEL. TABLE 12.

Group.	Mark.	Load at yield point, in lbs. per sq. in.	Tenacity in lbs. per sq. in.	Elongation per cent. in 8 in.	Relative resilience = tenacity × elongation.	Loss of resilience in per cent. of cold resilience.	Average of preceding column.	Average per cent. of elongation.	Average resilience.
1	A....	37,970	57,740	25.	101.5	.....	.....	27.	108.8
	B....	36,970	56,170	28.5	112.5	.....	.....		
	C....	38,820	58,170	27.5	112.5	.....	.....		
2	A_1...	58,590	69,680	16.	78.4	22.8			
	B_1.	57,740	70,540	17.5	86.8	22.8			
	C_1....	52,620	67,510	18.5	87.8	21.9	19.	18.3	88.4
	A_2...	54,460	67,260	19.	89.8	11.5			
	B_2..	61,860	68,540	18.5	89.2	20.7			
	C_2...	55,040	69,960	20.	98.4	12.5			
3	Aa..	41,540	68,410	15.5	72.4	29.			
	Bb ...	47,360	60,440	15.5	65.9	41.5	37.	15.3	68.8
	Cc ...	41,520	64,700	15.	68.2	39.4			
4	Ag ..	40,240	59,010	19.5	80.9	20.3			
	Ee....	39,530	56,461	23.	87.3	22.4	24.	20.5	82.8
	Cf ...	39,390	57,090	27.	80.2	29.7			
5	Ag ..	.....	59,440	2.	8.4	91.8			
	Bh ...	.....	63,570	11.5	51.4	54.3	76.	6.2	26.6
	Ci	.....	56,880	5.	20.	82.3			
6	Cold tests.	A_3 Bent 17 times; broke after straightening.		B_3 Bent 24 times, broke on 25th.		C_3 Bent 22 times; broke on 23d.			
	Hot tests, 572 degs.	A_4 Bent 6 times and broke.		B_4 Bent 7 times and broke.		C_4 Bent 7 times and broke.			

In the London *Iron* of Feb. 19, 1892, appeared a translation of Prof. R. Krohn's article upon the use of steel in bridge construction. The extracts include a few tests by bending metals when cold and also at a blue heat. Cold bending injured the metals only half as much as blue bending. The evil effect of the latter is most apparent in "bloom-faggotted iron," in which the harmfulness is twice as great as in either soft steel of 54,500 lbs. tensile strength or hard basic Siemens steel of 69,000 lbs. tensile strength.

In the same journal, on April 1, 1892, appears an article by F. Kintzlé upon "The Use of Basic Steel in Bridge Construction." In the course of it are the words: "Working at blue heat is injurious to weld iron and likewise to every kind of ingot iron; all working must be done quite cold or quite hot." Weld iron and ingot iron correspond to what are commonly known as wrought iron and mild steel.

CONCLUSIONS.

From these results of so many independent experimenters, extending from 1835 to the present, the reader can draw his own conclusions. I may, however, make a conservative summary as follows:

1. Copper boiler plate of moderate strength shows such a regular decrease of strength that it may be safely used if this is considered. At 400 degrees it has 85 per cent. of its cold strength.

2. Copper plate of very much higher strength holds its strength practically to 450 degrees, with no change in its already poor ductility.

3. Gun metal is unsafe at high steam pressures, decreasing in strength and ductility too early and irregularly.

4. Phosphor-bronze reduces in strength, but at 400 degrees still retains 70 per cent. of its cold strength. At 350 degrees is a drop in ductility.

5. Muntz metal of high strength decreases slowly, and at 400 degrees retains about 90 per cent. of its strength, with little change in its usual brittleness.

6. Cast iron, in Table 6 and fig. 1, shows no materia. increase nor decrease in strength, at least up to 500 degrees.

7. Wrought iron. The point of change and falling off in strength is somewhere beyond 600 degrees. In ductility its changes are more harmful than steel, the minimum coming earlier and more irregularly.

8. Hard steel does not retain its strength as well as wrought iron and soft steel, and the ductility falls off more.

9. Soft steel retains its strength and ductility better than any other metal, due perhaps to its very homogeneous internal structure. Various experiments go to show that the purer the metal the further off is the temperature of brittleness pushed and the less does it show. Careful attention to this matter may indicate the direction in which comparative freedom from this brittleness may be found, at least for the temperature desired to be used. Considering the increasing steam pressures of compounding and quadrupling, it would be advisable to include tests for "blue shortness" in all specifications for boiler steel to be used for high pressures. Practice, a familiarity with the behavior of steel and its fractured appearance at this brittle temperature, should enable the careful tester to determine the quality of the metal under consideration without elaborate testing apparatus.

Finally, as to the limit of steam pressure, it is presumable that 250 lbs. or 406 degrees, which is but 13 degrees above the temperature of the steam now used on French compound locomotives, would not enter unsafely into the danger region of blue brittleness of the purest boiler steel.

Mechanical Engineer's Office,
Pennsylvania R. R. Co.,
ALTOONA, *Pa.*, April 22, 1892.

Ontario & Western Terminals at Cornwall.

Messrs. Ross & Sanford, of Jersey City, are building for the New York, Ontario & Western, a coal pier and trestle and a bulkhead at Cornwall, N. Y., where the company owns a frontage on the Hudson River of 900 ft.

The retainer wall of the bulkhead will be at a distance of 300 ft. from the shore, running parallel to it. This space will be filled in with material dredged from the river, so that about eight and a half acres of land will be reclaimed. Along the front of this retainer and parallel with it will be built a platform or bulkhead 26 ft. wide and 708 ft. long, upon which will be laid a track connecting with the main line for handling general freight into barge and other vessels. A channel with 16 ft. of water at low tide and 50 ft. wide will be dredged the entire length of this platform to accommodate these vessels. The work above referred to is merely incidental to the chief object of making at this locality a commodious and important coal shipping terminus. Located on the south side of the bulkhead and running out at about right angles with it, a coal shipping pier 816 ft. long and 50 ft. wide is being constructed. On this pier will be erected a coal trestle with the base of rail about an average height of 28 ft. above high water, permitting the loading of the largest vessels. There will be four tracks on this trestle and 20 chutes for loading coal directly from the cars into vessels lying alongside.

There is a trestle approach about 400 ft. long, with a grade of 3 per cent., from the level of the inner end of the trestle on the pier. On the centre of this pier is a track for loaded cars with a down grade from the main line for about two-thirds the length of the pier, allowing cars to run by gravity to the foot of this incline, at which is placed a hoisting engine, which will haul the cars up an incline plane to the deck of the pier, at nearly the outer end. The grade of the trestle descends from the outer end toward the shore, so that the cars can be run by gravity to any chute on the trestle, unloaded, and then returned down the elevated trestle tracks to the storage yard for empty cars. The grade of the elevated tracks to the pier is such that cars may be run up by drill engines when it is not desired to use the hoisting engine.

To accommodate the large vessels which will load at this pier a channel will be dredged on each side of the pier 50 ft. wide, with a depth of 20 ft. at mean low water. The problem of disposing of the large amount of material taken out has been solved by the contractors in the following manner: They propose in digging the channel along the platform by means of a chute attached to the dredge to place the material from this trench behind the retainer. In disposing of the material taken from a long pier they have constructed special machinery. The method is to place a hoisting dredge on the platform, which will dig from scows brought alongside from another dredge working in the channel, into a large hopper. This hopper is arranged in connection with a powerful pump which, by a system of water jets under heavy pressure, forces the material through a large pipe to any point inside the retainer and in this manner evenly distributes the dredged material, disposing of it while reclaiming valuable land for the company.

The contractors now have a large force of men at work with three pile drivers, and at this time have about completed the platform and retainer and finished a large part of the work on the pier. The dredging operations will be commenced next week. The work is being pushed rapidly and it is calculated that the pier will be in shape to ship coal by Aug. 1 next.

English Train Accidents in 1891.

The British Board of Trade report of railroad accidents for the last calendar year has just been issued. The total number of passengers killed in train accidents during the year was five, and of employés 12, as compared with 18 and 12, respectively, for the preceding year. The principal details of the tabular portion of the report are summarized in the following table.

ACCIDENTS TO TRAINS.		Pass. Killed.	Pass. Inj'd.	Emp. Killed.	Emp. Inj'd.
Collisions (involving pass. trains)	112	4	492	8	67
Collisions (others)	31	..	1	3	37
Derailments (pass. trains), causes not classified	42	..	34	..	5
Derailments (fr't trains), causes not classified	7	..	..	1	3
Derailment (or collision) from misplaced switch	11	..	35	..	6
Derailment (or collision) approaching station too fast	32	1	172	..	11
Derailments (fl), unforeseen obstructions	144	..	2	..	..
Failure of brake apparatus	5	..	19	..	1
Failure of bridge	3	..	95	..	4
Other accidents which seem to be classified as train accidents	...	..	25	..	20
Total casualties from train accidents	...	5	875	12	154
Total casualties from other causes	...	98	737	537	3,007

It must be assumed that the foregoing accidents caused no injuries, except to passengers or employés; or that if they did the cases are included in the "miscellaneous" below:

OTHER PERSONS.

	Killed.	Injured.
At highway crossings	66	31
Trespassers	393	161
Miscellaneous	57	95

The aggregate of the above making the total "number of persons killed and injured in the course of public traffic" is, killed, 1,168; injured, 5,000.

To this is added a list of accidents "on railroad premises," as follows:

	Killed.	Injured.
Passengers	8	266
Employés	54	5,995
Other persons	17	179
	79	6,440

The total number of personal accidents reported by the railroads for the year is, therefore, killed, 1,247; injured, 11,500.

There are no less than 42 special reports by the inspecting officers on train accidents, to which is added a report by Major Marindin on the killing of five trackmen by a train. These 42 reports cover the last half of the year, the custom of issuing them quarterly apparently having been abandoned. The corps of engineer officers who have made these reports for several years, to wit, Major-General Hutchinson, Colonel Rich and Major Marindin, has been increased by the addition of Major Yorke, who is the author of a number of the reports in the present volume. We have not attempted to go through the whole of this list, but, as in the case of our last article on this subject, have selected such of the reports as seem from the index to be the most interesting or instructive. We have read Major Yorke's first, with a view of comparing him with the other inspectors. No important difference is apparent from the character of the reports, though his manner of summing up seems in some cases better than that of the other officers.

At Haughhead Junction, on the Caledonian Railway, December 26, the engine and five cars of a passenger train were derailed while running around a curve in a yard, under circumstances which General Hutchinson has discussed at considerable length, but which he is obliged to give up as inexplicable. The tracks and the rolling stock were all in good condition, and the speed was moderate. Moreover, none of the trainmen had been on duty too long, though what that had to do with a derailment like this is not easy to discover. The accident is identical with one that occurred in January, 1889, and "it is disappointing to find that notwithstanding the great improvements in the curves effected after that accident, another one should have taken place."

At Sanquhar, on the Glasgow & Southwestern, Dec. 5, a passenger train running a mile a minute was derailed at the heel of a trailing point switch, and the engine ran 1,100 ft. before it stopped. It appears that a freight engine which had just backed through this switch probably broke the fishplate and bolts. The passenger engine had a power brake which applied to about 51.7 tons out of a total weight of 71.8 tons, and it should not have run

(*Continued on page 372.*)

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

Published Every Friday,

At 73 Broadway, New York.

The subscription price is $4.20 a year in North America, and $6.08 in foreign countries.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Erie Canal boats are not practicing extortion this spring. Last Monday quotations for wheat from Buffalo to New York were 2 cents per bushel and Tuesday 2¼ cents—about half the average rates, perhaps. The railroads will have difficulty in making much out of the grain traffic if this continues; but it is hardly likely to continue, as the boatmen say "it takes 2¼ cents and good luck to get the boats around." Lake rates opened this week at 2 cents a bushel for corn from Chicago and 1¼ for wheat from Duluth to Buffalo, and coal was taken from Buffalo to Duluth for 30 cents and to Chicago for 40 cents per ton. These are living rates, but they do not leave much margin for reduction, or for any one to complain of the cost of moving his produce to market, though we must remember there are transfer and elevator charges in addition to these freights. Considering the great crops last year, the rates, especially by canal, are much lower than was to be expected; but there is really not much grain coming forward. The weather has not only spoiled the farmers' roads, but it has hindered all work in putting in spring crops, and with the coming of fine weather the farmers will have to give all their energies to their fields until the corn is planted. All that has been held back, is however, bound to come forward some time, and it may easily happen that the June movement will be remarkably large.

The Hungarian zone tariff is the subject of an elaborate review by Mr. Alfred Mange, an attaché of the management of the Orleans Railroad, which appears in the April number of the *Revue Générale des Chemins de Fer*. The author had the advantage of the official statement made by the Hungarian Ministry after Ulrich's study, which we reviewed recently, had been published. The most important new information in it, however, is that which shows that a considerable part of the increase in the long distance travel was due to diversion from other railroads. The corporation known as the Austrian State Railroad Company owned a line entirely across Hungary from west to east, to the Hungarian border, which was the shortest connection with the Rumanian railroad system. It did not attempt to compete with the Hungarian state rate of $4 to $10 for a distance of 550 miles from Budapest to the Rumanian border. In fact it could not without the co-operation of Rumanian state railroads, for while the distance from Budapest to Bucharest is but 554 miles by the Austrian state company route, 256 miles of it is in Rumania, while of the Hungarian state line between those places, about 640 miles long, only 8 miles are in Rumania. The consequence was that the traffic took the roundabout route. Moreover, the traffic of this private company was further effected by giving places on the Hungarian state line near the Austrian boundary the rates which by the zone system are given to places much nearer Budapest. This was done to induce the people to go to Budapest rather than to Vienna, when they lived much nearer to Vienna than to Budapest. Moreover, the private company had to reduce its rates between Vienna and Budapest, to meet those of the Hungarian state, which had a line for most of the distance. All this, doubtless, made the Austrian State Railroad Co., whose shares were held chiefly in France, all the more willing to sell its Hungarian lines to the Hungarian government, which it has done recently. The other important through travel diverted was that between Budapest and Fiume, Hungary's port on the Adriatic. The Austrian Southern has lines from Vienna and Budapest to both Fiume and Trieste, the latter the Austrian port, only a short distance further north. The Hungarian state roads not only secured all the travel between Budapest and Fiume by their low long-distance rate, but all that from Vienna to Fiume, and moreover diverted a good deal that otherwise would have gone to Trieste, by making Agram, which the passenger must pass in going to Trieste, a point like Budapest, beyond which zone tickets are not good, so that the passenger has to stop there and buy a second ticket if he would go to Trieste, it and Fiume being about equally distant from Agram. Hungary has subsidized a steamer line from Fiume to the Italian port of Ancona, and this is now the cheapest route to Rome, not only from Hungary and Austria, but from Berlin. All this, of course, is done to build up the Hungarian port, just as other provisions of the tariff are made avowedly to build up Budapest. Discriminations are made in their favor.

A correspondent discusses, in another column of this issue, some fundamental questions concerning signal lights, and offers a solution of one of the difficulties that perplex those who aim to make a perfect signal system. This correspondent assumes that no satisfactory form signal for night service has yet been devised, thus taking a position exactly opposite to that of Mr. Hammond in his letter published last week. This radical difference of view among men of experience must be taken as an indication that the problems now before the signal engineers of this country are not all easy to solve. It is apparent that the signal men have read the various contributions to the discussion which have been printed in these columns, but have refrained from expressing themselves on the questions brought up, for the reason that the formulation of definite and satisfactory ideas has been found a hard task. The first objection offered to the blue screen over the red lights will be that enginemen cannot see the screened lights until they are quite near them—until a long time after they first discern the white light. Purple and violet cannot be seen as far as red and green, and all of these are inferior to white in this respect. The white light does not tell the runner *which* track has been cleared for him until he discerns its relative position as regards the screened lights, and as some of the white lights on a post may lead to routes which he cannot safely traverse at his regular speed he will have to waste more time by slackening speed than his schedule provides for. We do not attach great weight to this objection, but it will have to be met a great many times if the attempt is made to generally introduce the screens. The weakness of the objection lies in the fact that where trains run at high speed *all* home signals giving indications for the high speed route should have distant signals, and a clear distant signal gives all reasonable assurance to the runner that, if he sees *any* all-clear signal on the home-signal post it must be the one for his track. Numerous objections to particular forms of signals are based on this claim that the lights cannot be seen far away, but the objections lose most or all of their weight when the fallacious notion of getting along without distant signals is withdrawn from their support. The fact that these objections are so readily removed, when once the critic adopts correct premises, is what gives importance to Mr. Hammond's strong plea for illuminated blades in the letter we have referred to: for, as we understand it, the most serious objection to those blades is, that they cannot be seen far away. We are glad to hear every new bit of testimony to the efficiency of form signals. Our correspondent to-day should, by the way, note the fact that the Boston & Albany arrangement of lights, concerning which he tells only the objections, affords a very good form of signal. The Chicago & Northwestern deserves credit also for its efforts to get rid of white-light signals, though it appears that those efforts have not yet been carried out so as to produce a consistent system throughout the company's lines.

The inspectors of the British Board of Trade who investigate railroad accidents may be regarded as in a very true sense the lawgivers of the nation on a good many points of railroad practice; as, for instance, signaling, the hours of labor and standards of inspection of wheels, boilers, etc. They simply make investigations and publish their conclusions; and their recommendations to the railroad companies (except when Parliament makes a special law) have no binding force. Whatever they lay down as correct practice has effect only as the dictum in each case bears evidence in itself of its reasonableness, and such a command is obeyed only by those who are enlightened enough to see that it is for their own best interest to obey it. But a law which is generally acknowledged to be right and just is, of course, the most effectual kind of a law, and therefore we find that the conclusions of these inspectors, published regularly for many years, have constituted an important element in raising to a high mark many of the standards of English railroad practice. The inspectors are officers of the Royal Engineers, and are generally acknowledged to be as independent as any human tribunal can be expected to be. We have heard them criticised for the alleged attempt to blame as many persons as possible for each accident, but in view of the tendency among railroad managers to shut their eyes to the weaknesses of their own discipline (where it costs too much money to cure it) and to satisfy the demands of their so-called justice by simply discharging one or more of the prominent offenders, instead of reforming them, this may not be an unpardonable fault. If there be any marked fault, however, in the inspectors' way of treating the subjects on which they are called upon to adjudicate it is this tendency to be ultra-conservative and strict; and we are led to mention this subject at this time by reading the opinion, in one of the reports printed in another column of this paper, that the only sure way to make an engineman run slowly at a certain point is to compel him to regularly *stop* at that point. There is any amount of *practice* in this country (as well as plenty of precept) which goes to show that this English officer's decision is the essence of old-fogyism; but as there are also numerous instances in American practice where the principle seems to be regarded with respect instead of derision we are curious to know what our superintendents think of Major Marindin's decision, and should like to hear from them. Our state laws, requiring the stoppage of trains at grade crossings not properly signaled, may be excepted from the discussion, as laws are expected to be several years behind the times, any way. Railroad men do not regard themselves as responsible for restrictions thus imposed. But there are numerous cases of rules like that of the Manhattan (elevated), with its 3,500 trains a day, where every train must come to a full stop at all grade crossings and junctions. On some roads an automatic block signal out of order requires the runner to bring his train to a full stop, no matter how heavy it is or how bad the grade, and even when he knows he can start again in 30 seconds. Now, is Major Marindin right, and is there no other way to discipline men to run with proper care?

Disputed Points in Railroad Bridge Designing.

Early last winter Mr. J. A. L. Waddell wrote for the American Society of Civil Engineers a paper on "Some Disputed Points in Railway Bridge Designing," which at once commanded wide attention in the Society, and now that it is published in the *Transactions*, will receive still further attention, at home and abroad. It appears, with the discussions of it, in the February-March number, just issued. We hope to give shortly a comprehensive synopsis of the whole matter, and, therefore, we shall now confine ourselves to a few points. The paper fills 42 pages of the *Transactions*, and the discussion fills 170 pages. Forty-three members contribute to the discussion, and among them are many men of high rank in the profession: although we regret that several of our most eminent bridge engineers have not taken a hand in. Perhaps they will do so later, for Mr. Waddell proposes to follow up the subject until something happens.

At the outset, every one who reads the paper must recognize the courage and candor of the author. He makes a direct assault on methods which have the sanction of high authority and of general practice, and concerning which there must be, in the nature of things, wide differences of opinion. He challenges hard knocks and he gets them. He sets forth his own opinions without hesitation or qualification, and must not grumble if some folks call him dogmatic; but we think that we see all through his paper an unaffected desire to learn the truth, coupled, to be sure, with a very strong belief that he knows a good deal of it already. Mr. Waddell's influence as a bridge engineer and as a writer on bridge engineering is already considerable, and justly so; but we suggest that a careful study of one of the earlier chapters of Ben Franklin's

"Autobiography" would be useful to him as a leader of opinion. He will see that the shrewdest of philosophers learned very early the value of the Socratic method of disputation. Hampden, too, after Cromwell the greatest man of the Commonwealth, was famous in discussion for his modest ways and his "flowing courtesy."

Mr. Waddell's objects are on the face of them worthy of the wide attention which they received. They are the simplification of methods of computing with a corresponding reduction in the amount of labor involved, the reconciliation of conflicting views on important matters, the inauguration of a series of much needed tests, and the ultimate evolution of a single standard specification for railroad bridges. These are clearly set forth in the conclusion of his résumé, which is as follows:

> In bringing this résumé to a close, I desire to enumerate the results which I hope will be accomplished by this paper and the discussions thereon.
>
> 1st. The abandonment of the engine diagram or concentrated load method of computing stresses, except for unusual cases, such as multiple systems of cancellation, and the adoption of the method of equivalent uniform loads.
>
> 2d. The adoption of certain standard engine and train loads.
>
> 3d. An exhaustive set of experiments to ascertain the dynamic effects on bridge members of all kinds, of live loads applied at various speeds.
>
> 4th. An elaborate series of tests of full-size members of steel bridges, especially compression members of all kinds.
>
> 5th. Ultimately, the adoption by the profession of standard specifications for bridge designing, which shall specify clearly and concisely in every particular such important matters as loads, intensity of working stresses, quality of materials, workmanship, etc., but at the same time shall not infringe upon the individuality of the designer.
>
> To the attainment of these ends it is my intention to devote all the time which I can spare from my practice; and I herewith invite the co-operation of all American bridge and railroad engineers, fully recognizing the fact that one engineer, unaided, can accomplish practically nothing, but with the hearty assistance of his professional brethren, there is nothing in reason that cannot be effected.

From a somewhat careful reading of the paper and the discussions, it appears that, first, "Uniform *vs.* Concentrated Loads," received far more attention from both the author and the contributors than did any of the other points. Nearly every contributor had something to say on this subject. The discussions suggest that the profession is getting ready to abandon the concentrated load system, and to adopt either the equivalent uniform load method advocated by Mr. Waddell or a uniform car-load combined with a single concentrated load. There are about twice as many who favor the former as there are who favor the latter method; and in the larger number there are included many very respectable authorities. Nevertheless, we are inclined to believe that the next general method adopted will be that of a uniform load with a single excess. Judging from the way in which Mr. Waddell closes his résumé, he evidently does not intend to let the matter rest, and there will be further debate on this point.

As to "the proper live loads for modern bridge specifications" there is a difference of opinion. Most of the writers admit, however, that it would be a good thing for all concerned if standard live loads could be adopted and used exclusively. Of those who contributed to the discussion, some approve of the standards submitted by Mr. Waddell, while others suggest modifications. These standards are good as far as they go, but they are not suitable for steep grades where the engines are necessarily heavy and the cars light. The addition of two standards for mountain lines would probably make the set complete and satisfactory. Mr. Waddell's scheme of communicating personally with the chief engineers and bridge engineers of all American railroads upon the subject of train loads ought to prove successful in establishing a limited number of standards.

As to "Amounts of Wind Pressure" the general opinion seems to prefer to limit the assumed pressure to reasonable amounts and to proportion every part of the structure to resist, not only the direct, but also the indirect effect of the wind, instead of specifying intensities that would cause all ordinary single track bridges to collapse; thus trusting to Providence that the bridge so designed will not be hit by a cyclone.

Some good points were brought out in both the paper and discussions on the "Effects of Wind Pressure." Most specifications do not state clearly how the wind stresses are to be computed. Competing bridge companies must, therefore, either take advantage of the specifications by making designs that cannot stand the test of expert criticism, or else use more metal than is called for directly by the specifications, and thereby run the risk of losing the contract. This is too important a matter to be passed over lightly, and every one should read carefully what Mr. Waddell says in his résumé concerning transferred load stresses.

In the matter of "Styles and Proportions of Bridges," making a canvass of the opinions expressed, we conclude that pony truss bridges are no longer legitimate, that plate girder spans should be used up to 90 or 100 ft., that single intersection web systems are decidedly preferable, that suspended floor beams are to be avoided when practicable and well stayed against motion when circumstances compel their use, and that there should be certain limiting depths for eye bars of various lengths. Yet on the question of suspended floor beams 30 of the writers expressed no opinion, and as to single intersections 33 were silent, so there can hardly be said to have been a vote on these matters. The best spacing for stringers is no nearer settled now than before the appearance of the paper, and its determination seems to be as far in the future as ever. The exclusive use of steel for bridges as advocated by the author is opposed by some, but the general opinion of engineers is now tending strongly toward its use.

We heartily indorse the following remarks made by Mr. Waddell in his résumé concerning the "Intensities of Working Stresses":

> In respect to this subject, it appears that we are all at sea; and we are liable to remain there until such time as the much needed experiments on actual intensities of working stresses that I have been advocating for years be made, after which we shall be able to determine upon a system of intensities that will be logical. Meanwhile we shall have to jog along in the best way that we can, letting each engineer use his own judgment concerning the intensities to employ, or perhaps (which is the best thing to be done under the circumstances) obtaining a consensus of opinion as to what system to adopt for a temporary expedient. The method adopted by Mr. Schneider of reducing all live load stresses to their equivalent static stresses before applying a constant intensity is undoubtedly the scientific way to proportion bridges, but until we have some real knowledge of the effects of dynamically applied loads, it does not seem advisable to develop a system that in all probability will have to be considerably modified in the future. It would not be such an immense undertaking to make an exhaustive series of tests of the effects of live loads applied to bridge members with varying velocities. Perhaps a year's time and an expenditure of, say, $50,000 would suffice. If not, more time and money should not be begrudged upon such an important matter. If the Government refuse to make such an appropriation, cannot one of America's millionaires be persuaded to donate the money as a contribution to applied science?
>
> In my opinion the proper steps to take after obtaining the money would be as follows: 1st. To appoint a committee of seven members of the Am. Soc. Civ. Engrs., who are acknowledged bridge experts, to act as an advisory board, and let them lay out the series of tests (to be modified later if thought advisable), appoint a committee of three well-paid expert bridge engineers to make the tests under their instructions, attend to all payments of money, make arrangements with railroad companies for the use of their lines and bridges in making the tests, etc., etc. . . . Experiments should be begun systematically upon all parts of bridges of modern design, for trains varying in velocity from zero to the greatest attainable speed. Sufficient tests of all kinds should be made to give good average results. Both tension and compression members should be experimented upon, and if the machines prove to be very accurate, even such intricate problems as the distribution of stress in plate girders might be solved. This field of experiment is a most inviting one, especially because of the great utility of the results; so there would be no difficulty in obtaining an expert committee to make the tests.

It appears that Mr. Gaylor's discussion on "minimum thickness of metal in railroad bridges" has convinced Mr. Waddell that the limit should be three-eighths of an inch. Practically, Mr. Gaylor proved his point, and has thereby rendered an important service to the profession.

We are inclined to disagree with Mr. Waddell and a number of others on the question of reaming. Some claim that this operation is unnecessary for mild and medium steel, but in our opinion all steel and wrought iron work should be reamed, for two reasons: first to insure the matching of the rivet holes, and second to cut out any metal injured by the punching process.

Mr. Waddell urges increasing the clear roadway for single track through bridges to 16 ft., and for double track to 29 ft. He thinks that with such width, a proper floor system and efficient protecting and rerailing apparatus at each end of the bridge, one could save fully 90 per cent. of the bridge accidents caused by derailments. This is very possible, but we should like to see the statistics. The value of rerailers is still disputed, and we know men in whose experience butting posts have done more harm than good. Therefore, while we would like to believe Mr. Waddell is right, we beg him to give us records. Or is 90 per cent. just a guess?

The last paragraph of Mr. Waddell's résumé is: "Finally, I would suggest that further discussions of this paper, with its discussions and the résumé, are in order, and that they can be published in later issues of the *Transactions* of the American Society of Civil Engineers." We suggest that advantage be taken of the invitation, and we wish, in conclusion, to once more express our approval of the course Mr. Waddell has taken in bringing up the subject of bridge designing for discussion. He may depend on our hearty co-operation in the work he has laid out.

The Railroad Commissioners of New South Wales.

The state control of railroads in a country with parliamentary government and pretty nearly universal suffrage, must be full of political complications. Last week we noted the fact that Mr. Eddy, the Chief Commissioner of Railroads of New South Wales, has to stand an investigation of charges of collusion with English locomotive builders in the matter of the purchase of locomotives for the colonial railroads. From Sidney papers of April 13 and 14, just received, it appears that the Commissioners are being hauled over the coals by a Royal Commission for having bought American locomotives. So they catch it on both sides.

We have not received any particulars of the hearings in the matter of the English locomotives, but suspect that they will fall to the ground because of entire lack of evidence. The testimony in the other investigation is summarized in another column. So far as it has gone nothing has been brought out to justify the attack. For months a fierce newspaper war has raged in the colony over the American engines, and the inspiration of the attacks on them is not hard to find.

In the first place there is a strong effort among the politicians of the colonies to curtail the powers of the Commissioners and to bring the railroads back under political control. This has been accomplished in some of the colonies, and in spite of Mr. Eddy's best efforts it seems likely to be accomplished in New South Wales. That probably is the most important element at the bottom of the agitation, and so far the question of locomotives has little importance. It merely gives the politicians a handle. Furthermore, the "labor" party is very strong in the colonies, and is always trying to create or sustain "home industries." Business competition enters, finally, to stimulate attacks on one side or the other.

There is a little basis for the complaints about the American engines. They were put at once into heavy and fast service, and several of the journals on the trucks ran hot. The truck wheels are 30 in. diameter, with 5 × 10 journals, and carry 28,000 lbs. (on two axles), including the weight of wheels and axles. This is much less than is often carried on trucks of high-speed engines in this country. The only accident that we have heard of was the twisting off of one journal. The axles were of hammered iron by one of our first-rate makers, but at the request of the Railway Department steel axles, with 6 × 10 journals were sent out to replace them. It is probable that had reasonable precautions been taken in running these engines at the start there would have been little trouble from heating. They were at once put to work on bad track where the schedules often called for 50 miles an hour between stations. There was some trouble at first with the reversing gear also. The statement of Mr. Hoyle that cracked driving wheels had been found seems to have been entirely without foundation. The engines were free steamers, well counterbalanced, easy riding, fast and powerful, and favorites with the drivers. We have but few figures of their competitive performances, but hope to be able to publish them soon.

The Mexican Railway.

The Mexican Railway Co. shows more and more the effect of the competition of the new lines, which are now beginning to get a share of the direct European exports, the Mexican Central having made a harbor at Tampico which is entered by large vessels. These imports have given the Mexican Railway (Vera Cruz to Mexico) a very large part of its profits, the gross earnings from them having been more than half its total freight earnings, and the rates on them having been until recently more than 20 cents (silver) per ton per mile, or say seven cents in our currency, which is equivalent to $3.20 per 100 lbs. from New York to Chicago. This was much more than the average rate on the other freight, and as the foreign freight has a much longer average haul than the other we may assume that the net earnings from it were much larger in proportion than the gross earnings. In the second half of 1888 the foreign freight paid an average rate of 10.82 cents (silver) per ton per mile with an average haul of 197 miles, and the other freight an average rate of 7.62 cents (silver) per mile, with an average haul of 70 miles. Estimating the cost the same for both, the profits from the foreign freight were much the greater. The report for the last half year shows the average rate on imports reduced to 7.43 cents per ton mile, and that on other freight to 5.40 cents. And this does not indicate the whole of the reduction, for meanwhile the price of silver has fallen considerably.

But the competition for the direct imports did not fairly begin until after the close of the period covered by the company's last report. During the first four months of the current year the gross earnings were $302,050, or 21½ per cent. less than last year, probably due more to lower rates than to lighter traffic, so that a

corresponding decrease in expenses is not to be expected. It is noticeable that the Mexican Central, which now includes the earnings of its Tampico Branch and 276 miles more than last year, while reporting 10½ per cent. more gross earnings than last year in the first three months of this year, had 13½ per cent. less net earnings, indicating that the new line may have been worked at a loss, which would not be at all surprising during this first period of its working, before the port is finished, and when vessels have only begun to find their way there.

The net earnings of the Mexican Railway in the second half of 1891 were 30 per cent. less than in 1890, and nothing could be paid on the ordinary or second preference shares, but the first preference shares received a dividend of 3.75 per cent. For the first half of 1891 the first preferences received 4 per cent., the second preferences 3 per cent., and the ordinary shares 1½ per cent. The amount available for dividends was not half as great in the second as in the first half of the year. The decrease in gross earnings for the first four months of this year is about one-third more than the amount paid on the ordinary and second preference shares from the profits of the first half of last year, and, unless there is a decrease in working expenses, this indicates profits sufficient for not more than 2½ per cent. on the first preferences during the current half-year.

The subject is interesting here because it has seemed, ever since the new lines in Mexico were planned, that the Mexican Railway Co., with its enormously costly road and very high rates, would be put into a very difficult situation. Fortunately for it, the lines planned which would compete with it most directly were not built till late, and are not all built yet, while most of those actually built should tend to increase, rather than decrease its traffic. In fact, its traffic has increased, but its rates have been reduced materially; and if the Tampico improvement makes that harbor as good as is expected, they must suffer a still further decrease, especially if the projected direct line from Tampico to Mexico, which will reduce the distance from 778 to 328 miles, is built.

A very commendable feature of the Mexican Railway report is its statement of the progress of competing lines and the other facts which are likely to *injure* its income. This is a duty which every company owes to its shareholders, especially when most of them live far from their property, and one which is rarely performed in this country.

The reputation of Massachusetts as a conservative state in matters of railroad regulation seems likely to suffer a good deal by the acts of the present legislature, and especially those of the Lower House. The recent law compelling the members to pay their fare on railroads, which many of them probably voted for because they did not dare to do any other way, was enough to set almost any "statesman" "agin the railroads," and in addition to this it appears from the reports of the discussions that the native ability of the members is by no means above the general average of former years. The House last week passed a bill forbidding railroads, whose stock sells for $115 a share or over, to charge more than two cents a mile for carrying passengers. This may not prove to be unjust, generally speaking, but the legislators deserve little credit for discernment, for they seem to have been impelled by the usual Western motives in casting their votes. A bill has also been passed declaring sleeping car companies subject to the regulations governing common carriers, and requiring them to push up an upper berth (when it is unoccupied) if the occupant of the lower berth desires to have it raised. This bill probably originated with some Minnesota statesman who has emigrated eastward, and will probably prove about as important as the action that was taken in that state on the same subject. Bu the next law is of more serious consequence; it concerns the grade crossing law under which the state assumes one-fourth of the expense of constructing bridges, etc., to abolish the dangers at road crossings. To avoid possible injustice by reason of unreasonable demands of municipalities the original law has a clause providing that railroad companies need not change the grade of their tracks if they do not wish to, thereby giving them power to block any plan demanding exorbitant expenses in this respect; but the House has now passed a bill giving the State Railroad Commissioners power to change such grades. It remains to be seen whether the Senate will pass all these bills.

It appears that the New York, New Haven & Hartford did not succeed in ignoring the New York & New England, in making its arrangements for fast trains to Boston, after all. The Shore Line and the Boston & Albany trains, running through in 5¾ hours, were put on May 16, but now it is announced that the New York & New England six-hour trains leaving each terminus at 3 p. m. will have their time reduced on May 22 to the same figure as the others. This is the "White train," and it will continue to have ordinary cars as well as parlor cars, the same as heretofore, so that it will be the only train on which a passenger can go through for $5 in less than six hours. It appears that most of the acceleration has to be made on the New England portion of the line, the schedule providing that the 86 miles between Boston and Willimantic shall be made in 2 hours and 5 minutes, whereas a strict mileage schedule would make the proportion for this part of the line 2 hours and 17 minutes. On the other hand, the trains running over the Boston & Albany traverse the 98 miles of that company's lines in only three minutes less time than the six-hour trains, the remaining 17 minutes being made up by the New Haven road. The way these changes have been made would seem to indicate that the New York & New England's contract with the New Haven road is in some important respects as favorable as that of the Boston & Albany, and that both contracts afford good protection to the Eastern roads.

On Thursday, May 5, the Pennsylvania lines began a novel experiment by sending a solid train of grain without change of engines from Chicago to Philadelphia. This train consisted of 40 Union Line cars of 60,000 lbs. capacity and one engine. It went through without a break or unusual delay in five days, averaging about 15 miles an hour for the entire distance. No attempt was made to make fast time, and the train had a helping engine over heavy grades. The engine has returned to Chicago. A second train left Chicago on May 12 at 9:40 a. m., composed of 35 cars, similar to the first, and one engine. Mechanical men will look forward with much interest to the results of running an engine between two points so far apart, as many of them will question its expediency. The distance between division points for changing engines has been increasing for the past few years, and some Western roads are running their engines 200 to 300 miles where they used to run them 100 miles or less. Possibly the most economical distance to run an engine is greater than is now customary.

A prisoner in the Tombs (New York City) named Alphonse Vouillaire proves to be the man who stole the various railroad documents which furnished the material for the long article printed in the Chicago *Tribune* last month (and referred to in the *Railroad Gazette* of April 22), giving strong circumstantial evidence of violations of the Interstate Commerce law by certain railroad officers. The man was arrested on a charge of forgery, the complainant being a livery man in New York. Vouillaire had been clerk in the claim departments of several railroads, and on leaving these places, after having stolen a large number of papers, he was for a short time employed as a special agent by the Interstate Commerce Commission. The New York *Herald* has reprinted most of the material that appeared in the Chicago *Tribune*, and puts it forth as an original sensation.

The Railroad Commissioners of Georgia have issued a circular modifying their rule concerning demurrage on freight cars so that "when any consignee shall receive more than four cars" all cars in excess of four must have 78 hours' free time allowed. It does not appear from the circular whether these four cars must be in a single shipment, or must all come on one train, or within one minute or one hour, or one day; so that the only practicable way for the railroads to carry out the order equitably will be to make an agreement with regular consignees as to how the rule shall be applied.

Philadelphia & Reading locomotive No. 618, recently turned out of the Baldwin Locomotive Works, is now drawing one of the five-hour New York and Washington express trains, and on May 13, drawing four heavy cars, it left Wayne Junction (Philadelphia), 17 minutes late, and ran to Jersey City 85 miles, in 87 minutes. A distance of 10 miles was run at the rate of 79.6 miles an hour. There was a considerable adverse wind. This engine is a compound of a somewhat novel pattern and a drawing of it was published in the *Railroad Gazette* of Nov. 13 last.

The Pennsylvania road now has its line for 19 miles west from Philadelphia almost entirely free from grade crossings, and the few remaining crossings are soon to be abolished. For the 15 miles between Overbrook and Paoli, where there are 15 stations, there are no street crossings at grade and at every station except one there is an over or under passage for passengers to cross the tracks. At this one station, Wynnewood, the contract has just been let for the construction of an under passage.

NEW PUBLICATIONS.

Transactions of the Technical Society of the Pacific Coast, March and April, 1892.

The principal papers in this issue are on "A Water Pipe Built of Wooden Staves," "The Sickle or Perfect Railroad Curve," and "Grips and Brakes on Street Cable Railroads." The paper on the Sickle curve is very long, and is a development, with many formulæ and tables, of a new form of transition curve. In the April issue there is also a discussion of the effect of modern brakes on railroad structures.

Journal of the New England Water-Works Society, June, 1892.

This publication is issued quarterly, and may be had from the Secretary, Mr. R. C. P. Coggeshall, New Bedford, Mass. The June issue contains the report of the last quarterly meeting, with many papers of considerable importance.

TRADE CATALOGUES.

The House of Henry R. Worthington, New York, publishes under date of April 1 a new catalogue of pumping engines, steam pumps, condensers and water meters. The catalogue is not only remarkably well arranged and printed but has a good index and a telegraphic code.

The Lidgerwood Mfg. Co., New York, publishes a pamphlet with the title of Open Pit Mining. It contains sketches and descriptions of hoisting and conveying devices employed in open pit mining, quarrying and construction work.

The Link Belt Machinery Co., of Chicago, issues circulars illustrating its lifting and conveying machinery. Among the devices shown are elevators for ashes, bales, ice, etc.

The Acme Water Lift Co., of Jacksonville, Fla., issues a small pamphlet with two photographs illustrating the Acme water lift for raising water for locomotives. This device was described very briefly in the *Railroad Gazette* some months ago. The lift is devised to raise bodily 2,000 gallons of water, more or less, from a well, or other source of water supply, and empty it into a tank. At the same time the well and tank are automatically covered and uncovered. This is done by a locomotive, power being transmitted to the lift by a wire rope.

The Lunkenheimer Brass Manufacturing Co., of Cincinnati, O., has just issued a new catalogue. As our readers know, this company makes a very large line of furniture for locomotive, marine and stationary engines in the way of cocks, valves, grease cups, lubricators, whistles, etc. The catalogue just issued is very well illustrated and contains brief but sufficient descriptions and directions.

Illustrated Catalogue of the Graphite Productions of the Joseph Dixon Crucible Co., Jersey City, N. J.—This catalogue contains a very large list of graphite preparations including lubricants in great variety as well as pencils.

The Hinckley Automatic Brake Slack Adjuster.—The Hinckley Brake Co., of Trenton, N. J., publishes illustrations and a description of its apparatus, of which some account will be found on another page of this issue. One of the most interesting plates shown is a comparative record showing a diagram of automatic and hand adjustment of brake slack for four months. A portion of this record was published in the *Railroad Gazette* last January.

Bending and Straightening Rolls form the subject of a special catalogue just issued by the Niles Tool Works, of Hamilton, O. As most of our readers know, this concern makes some of the largest machine tools in the country. The catalogue shows bending rolls with independent engines, and also machines arranged to be driven by belt, and there are numerous sizes, up to No. 12, with rolls 25½ in. in diameter, capable of bending iron plates 1½ in. thick and 22 ft. long. There is also a large vertical bending roll. Testimonials are shown from a large number of railroad and other shops.

English Train Accidents in 1891.

(*Continued from page 369.*)

1,160 ft. before stopping, but the inspector makes no severe comment on this. The mode of fastening the heel of such switch rails by fish plates and short joint chairs is "not the best," and the inspector thinks "the company would do well to abandon it with as little delay as possible."

On Nov. 27, at Sandal, on the Great Northern, there was a rear collision of freight trains during a thick fog at 9:38 p. m., throwing five freight cars on to an adjoining track, which were run into about 1½ minutes afterward by an express train running 60 miles an hour. The express cut its way through the obstruction, and ran 4,500 ft. before it stopped. The first conclusion of Major Yorke is that the accident cannot be attributed to the fog; but it appears nevertheless, that the signalman admitted the second train because he forgot or carelessly ignored the fact that the foremost train was still between his home and starting signals, and if there had been no fog, or if he had had an electric indicator operated by a track circuit, to remind him of the presence of the train, he probably would not have overlooked it. His error occurred in this way: The foremost train passed the tower cautiously and the signalman, to encourage the runner to go faster, showed a green hand light out of the tower window. But the waving of a green light indicates caution, and the runner claims that this light was being waved, instead of motionless. At any rate he took it for a caution signal, and so moved slowly, and when he reached the starting signal he found it against him and accordingly stopped The signalman had thrown the signal on after he thought the freight had had time to get by it. The trainmen went back to the tower to learn what was the matter, and while they were talking with the signalman, he suddenly shouted to them to run and put torpedoes on the rail, as he had allowed the next station back to send on another train. On the investigation the signalman claimed that he wanted these torpedoes placed as an extra precaution; but Major Yorke rightly

concludes that "this explanation carries no conviction with it," and the evidence goes to show that the signalman's anxiety was based on the fact that he had lowered his own signals, and that a collision was therefore imminent. The signalman not only pulled off the signals for this second freight, before the preceding freight had reached the next station, but did precisely the same thing for the express train which ran into the wreck on the other track. This man had been signalman for six years, and Major Yorke states that he bears a good character, which leads one to wonder what a "good" character (reputation) is based on in those parts. The man's conduct would seem to indicate, if not foolhardiness, at least that moral standards had but little to do with his manner of obeying orders. The arrangements for providing fog signalmen at this junction are criticised. One man, stationed at the tower, has to attend to two signals 834 ft. apart.

At Accrington on the Lancashire & Yorkshire, Dec. 15, a freight train which became uncontrollable on a descending grade ran into a side track, at the foot of the hill, which led to a freight house, and a laborer was killed. It appears that it was according to rule to turn runaway trains into this side track rather than let them go on where they might foul an important junction. The causes of this collision were of the kind that sometimes seems insignificant, but there were several of them. First, the regular runner was laid up, and a fire man of insufficient experience was in charge. He was warned that the automatic brake (on the engine only) was "treacherous," but the meaning of this term seems to have been in doubt. The conductor stopped at the head of the grade and pinned down six "double clipper" brakes and one ordinary brake. This was not enough, and the locomotive runner was blamed for not looking after this matter, the responsibility being placed by the rules partly upon him. The runner was also careless, knowing his automatic brake to be unreliable, in not finding out how many hand brakes had been pinned down. Again, the collision would probably have been averted if he had whistled for the caboose brake earlier. He was, however, partly excused because he had been refused a copy of the appendix to the time table. The chief guard on this train had been on duty 15½ hours, and "was probably smarting under a sense of disappointment at not having been relieved" in accordance with a request he had made, and some allowance must be made, says the inspector, for a man who had been so long on duty. This man had had 18 years' experience. Major Yorke recommends that the rule be amended so as to require guards to consult drivers as to the number of brakes to be pinned down. A distant signal which figures in this collision is located no less than 3,300 ft. from the home signal. Major Yorke furnishes a diagram of the tracks where the collision occurred. This makes the report readily intelligible, whereas most of the reports are largely unintelligible unless the reader carefully peruses every word so as to make a mental map for himself.

At Willesden on the London & Northwestern, December 23, a passenger train standing at the station was run into at the rear by a freight, slightly injuring 12 passengers. There was a dense fog at the time, and the standing train could not be seen from the signal box. A boy who assisted the signalman in timing trains took the liberty to pull off the signals for the freight without leave. Preliminary to this chief error, he booked the passenger train as "out of section" before he was authorized to do so. He said that he heard the bells of the instrument ringing and misunderstood them. Major Yorke says that the boy has a very good character for intelligence and industry. The engine of the freight train was deficient in brake power; had it had a steam brake the collision would not have been so bad.

At Ramsgate, on the London, Chatham & Dover, Oct 31, an empty excursion train drawn by a locomotive running backward became uncontrollable on a descending grade, ran off the end of the track at the terminus, and across a public road, killing a street peddler standing on the sidewalk, the approaching train being hidden from him by a board fence. The locomotive had no connection on its front end for the automatic brake, it being "unluckily one of the only two engines belonging to the company still to be fitted" with such a connection. It had to be run tender first in this case, because it had to be turned at a station several miles away, and was preparing for its home journey at night. The failure to control the train by the hand brakes is believed to have been partly due to the mistake of the rear guard in screwing the hand brake the wrong way, which Major Marindin says is a thing that has been done more than once in his experience. He thinks that the engineman in this case probably forgot that the continuous brake was not working throughout the train. Similar accidents occurred at this place in 1883 and 1889, and the warning of the inspector in 1883 has not been heeded. But since the accident now under consideration, the company has issued a special order requiring all trains to be stopped at a signal 900 ft. short of the buffer stops; and the signalman is not to admit them to the station until they have thus stopped. Major Marindin repeats the admonition heretofore given, to forbid the use of the continuous brake at all terminal stations, except in emergency. The steep grade here (70 ft. per mile) lies in a tunnel which is about one mile long, and it appears that the home signal is at the lower end of the tunnel, and the distant signal at the upper end. Concerning the rule now adopted, requiring a special stop as a safeguard, Major Marindin says: "This is a good regulation, as it allows a considerable margin for a train over-running the stopping point; but Ramsgate station is a very exceptional place requiring exceptional treatment, and I think that more is wanted. What is, in my opinion, absolutely necessary is that trains should be got well in hand before entering the tunnel on this steep incline, and the only way of insuring this is to order that all trains shall come to a dead stand at the distant signal at the entrance of the tunnel, for experience has shown that very little reliance can be placed upon the strict observance of any notice enjoining simply a reduced rate of speed at any particular point."

Major Marindin's special report of the killing of a section master and four laborers near Yorkhill on the North British, Sept. 10, affords no lessons not heretofore known. Men have been killed in this way many times in England, and the clearing-house regulations have been amended several times in consequence. They are now very minute and complete, but it appears that the paragraph requiring men always to step aside into the ditch instead of upon other tracks is not strictly observed on the North British road, and the inspector recommends the company to issue a special warning. These men were working on a straight line. The engineer claims to have seen them some distance off, and to have thought that they were between two of the main tracks, but he is blamed for not having sounded the whistle warning soon enough. Not all of the amended rules of the clearing-house had been adopted by the North British, although they had been in print for some time waiting for the proofs to be corrected, and "it is to this delay in issuing the rules that this sad accident can in some measure be attributed."

Rules of Interchange—New England Railroad Club.

At the meeting of May 11 the President said the subject selected for discussion this evening is Rule 8 of the Code of Rules of the Master Car Builders' Association, and other rules that may be suggested, the subject to be opened by Mr. John T. Chamberlain.

Mr. CHAMBERLAIN: The reason that Rule 8 or most of it was adopted at the last annual convention of the Master Car Builders' Association, was in consequence of the necessity of getting at the private lines in such a manner that in doing their repairs where necessary, the railroad companies would be reimbursed—to get pay for brasses, brake-shoes, truck and body bolsters, springs and the like, which are constantly wearing out, leaving also in effect the rule that repairs on cars belonging to any railroad company, where the materials are liable to be constantly worn out, such as the articles above referred to, are to be charged to the owner of the car. By that means we thought to compel private lines to pay for what they ought to pay for, and at the same time it was equity that cars running throughout the country owned by railroad companies ought to keep up such parts as have been named at their own expense, and to make good the wear and tear. Almost every man connected with the head of a car department is in favor of wiping out that rule as it now stands, leaving perhaps one or two items, one of which would be as it was last year with regard to roofs lost from cars, and also that if brasses are taken out or brake shoes renewed or springs changed, the expense shall be to the road making the repairs. On our road, while we have made a good many bills for brasses and brake-shoes, many of them have been returned, some in consequence of not finding the cars on the line, they having been delivered to another connection at nearly the same time, and the dates on the records not having been very carefully entered, and also inspectors sometimes furnish the wrong numbers. The return of the bills causes annoyance and extra employment is necessary.

As far as railroad companies are concerned, while we have made a good many bills against other companies under Rule 8, we have paid a great many, and our company is no richer than if the rule had not been enacted; in fact, we have lost money, if we take into account the extra reports required and the extra help. Wheels and axles always have been and probably always will be charged to the car owners. Roofs replaced should be charged to the owners of the cars. I think the inspection should be rigid, and the roads should pay for any damage they do to the cars. I think that Rule 8, should be so changed as to give railroad companies the right to make the bills and collect, regardless of where the mileage accounts are kept and of whether the superintendent of the road will make an arrangement with the railroad company whereby they may evade the charges they ought justly to pay.

MR. ROBERTSON: I represent the Central Vermont Railroad. We have several private lines over our road, and these lines always reimburse us for any repairs that are necessary. I agree with Mr. Chamberlain that there is a large loss of time in making out bills, and extra clerk hire is required in conforming to Rule 8, which is to the detriment of the railroad companies in general, and I think it would be well to get rid of that rule so far as repairs to running cars are concerned. With regard to cars running in privats lines, I feel that if there is any benefit to railroad companies so far as the business of private lines is concerned, it would be well to favor them in some respects. I think there should be a rule which would cover private lines as to repairs which would conform somewhat to the rule for general repairs on railroad companies' cars.

Mr. MARDEN: You refer to Rule 8 as a whole, or that part which has reference to brake-shoes and brasses?

Mr. ROBERTSON: I refer to brake-shoes and brasses particularly. We find that the repairs on the cars we receive on our road, foreign lines, stock cars, refrigerator line cars, coal cars, are very slight outside of brasses and brake-shoes. The least repairs we have to do are on the National Despatch line of cars.

Mr. LAUDER: The difficulties of carrying out Rule 8 have been to a certain extent exaggerated. It is not a very serious matter to make out bills at the end of the month for such brasses and other parts as properly should be charged under that rule, as perhaps the remarks already made would indicate. We send out a good many and some are sent back for explanation. It doesn't take long to dictate a letter to a typewriter, or to send a bill. I think Rule 8 is a very just and equitable rule. I don't think it makes much difference to the railroads whether that rule is in force or not, but I think it is a means of getting hold of private car lines which you cannot reach in any other way. Private lines run a large number of cars all over the country, and once across the continent may wear out the brasses. I oppose the annual tinkering of the Master Car Builders' rules, unless there exists some strong reason for it. It requires a good deal of time for the inspectors to learn new rules, and they are apt to get mixed up and get the superior officers into trouble on that account, and I hope Rule 8 will stand as it is now.

Mr. FLETCHER: Speaking about private lines, there are two sides to this question. You seem to think that you only are the sufferers on your side. However, when you lose a car you never replace it. Why? Because you can pay for it cheaper than you can replace it; and we have had cases where it cost us $200 more to replace one of our cars than we received for it when it was lost. In behalf of the National Dispatch Line, I would say that we use all possible efforts to keep the cars in good running order and spare no expense, and we are always ready to pay any proper bills that are presented to us.

Mr. MARDEN: I think part of our difficulty in regard to Rule 8, so far as brasses and brake-shoes are concerned, arises from the fact that no specified charge is designated for labor. Different roads charge differently, some half an hour, some an hour, and there is a dispute as to how much time it really takes to change a brass. Quite a number of the roads have issued circulars to the effect that they will not receive any bills with labor charges in them. Other roads have entered into an agreement, one with another, to do away with the labor charge entirely, as far as charging for brasses and brake shoes is concerned. Some roads have occasion to change more brasses, and particularly brake-shoes, than others, and there are quite a number of roads which have no bills to make for those articles, while others have a considerable number. I think, if any change is made in the rule, some provision should be made for a uniform rate of labor to be charged. I believe in charging private lines for running repairs on all such parts as fail under fair usage. I think the mileage they obtain should cover that, and I think it is so intended.

Mr. LAUDER: There should be something definite as to whether charges should be made for labor or not, and if made, the charge should be arbitrary, as it is in other matters.

Mr. BUTLER: I don't think it is right to charge for the labor. It takes but a short time to make the change. From a good many roads bills are received where there is no labor charged, and in all those cases we do not charge any. Further than that I should be satisfied to let the rule remain as it is.

Mr. ROBERTSON: I think it would be well enough to have the price for brasses and brake shoes large enough to cover the labor.

Mr. CHAMBERLAIN: I don't think a brass can be put in in ten minutes and have it done properly. I made a test of some 20 or 25 cars, coming to us just as they ordinarily come, and I found it took an average of twenty minutes to make that change. I have never charged anybody over half an hour for putting in a brass since we commenced with the second month of the operation of the rule; but, as Mr. Butler says, a great many roads have waived the labor charge entirely.

Mr. FLETCHER: I should like to inquire if it is considered just and proper to make a charge for renewing a brass where a journal made it hot. I have had bills sent to me from other roads for the same car three days in succession, and they have acknowledged that it was from the brass running hot, and it does not seem to me that is fair.

Mr. LAUDER: I think if a brass is worn out by reason of running hot, it is the fault of the road that caused the damage; and it seems to me no one should make a charge either to another road or private car line for a brass that was substituted for one worn out by reason of getting hot. I should not allow it.

Floods in the West and South.

Heavy rains have continued throughout the Mississippi and Missouri Valleys and extensive tracts have been flooded, in addition to those reported last week. The money loss has been heavy at many places and some of the reports tell of loss of life, though, as before, they are generally somewhat indefinite. Many railroads have been submerged at various places and trains stopped, but the extent of permanent damage cannot be estimated.

At St. Louis the Mississippi was higher on Monday than at any time since 1858, and traffic across the Eads bridge had to be suspended because the tracks of several or all of the roads centring at East St. Louis were under water. The Burlington, the Alton and some other roads ran their passenger trains over the Merchants' Bridge. The Chicago & Alton tracks for a distance of four miles from the bridge were out of sight. At Alton, Ill., long stretches of railroad embankment were badly washed. On Wednesday the east approach of the Union Pacific bridge at Omaha was reported washed away and the bridge impassable. Fears were expressed for the safety of the bridge itself. The St. Louis, Iron Mountain & Southern suffered badly in Arkansas, and no trains entered Little Rock for four days. One report states that 13 bridges on this and the St. Louis Southwestern road were carried away. A stretch of eight miles of the Louisville, New Orleans & Texas Pacific was reported under water. The Harlem Crevasse below New Orleans has baffled all attempts to close it, and the New Orleans & Southern Railroad was still blocked at last accounts. All the railroads in the Mississippi Valley south of Cairo have large forces of men at work protecting their roadbeds. In Arkansas and Louisiana whole counties are reported under water. On Sunday there was a severe storm in Western Pennsylvania, and an iron bridge was wrecked by a tornado at Confluence.

Our Chicago correspondent wrote on Tuesday as follows (we omit facts already noted above): The floods in the South and West have done more damage to farms and city property than to the railroads. It appears that the railroads have been remarkably free from heavy

losses when the unprecedented fall of rain is considered. Passenger trains in the vicinity of Chicago are now generally making schedule time. At the present writing the flood is beginning to be felt in the South, through Arkansas, Mississippi and Louisiana. The damages reported by newspapers and by the officers of Western roads, in the majority of cases, are confined to a few heavy landslides, washing and softening of tracks. The Hopkins branch of the C. B. & Q. was washed out and was impassable for four days. At Leavenworth the railroads were all submerged. The suburbs of Kansas City, Argentine and Armourdale are under water, but the railroads have suffered no great losses. At Waterloo, Ia., the tracks of the Burlington, Cedar Rapids & Northern and the Chicago, St. Paul & Kansas City are washed out at several points. At St. Louis the Chicago & Alton has made transfers by steamers and a few of its trains have been sent to St. Louis over the Merchants' bridge. Two trains left for the East Monday, the only ones over this line out of the city for a week. The Burlington sends its St. Louis trains over its lines on the west side of the river.

In Illinois the trouble has been worst in the Illinois River Valley. At Peru and La Salle the railroads enter the city along the river banks, and their roadbeds were badly washed. The Chicago & Northwestern lost two bents of a trestle at Spring Valley Mines. At Pekin the La Marsh Drainage district was overflowed by a break in the protecting embankment. The break occurred at a sand embankment where the Peoria & Pekin Union had filled in a trestle.

In the South the levees are giving away at various points. Reports on Tuesday showed that crevasses were formed at Gaines' Landing in what is called the Panther Forest Levee, and at Bonnet Carré in Louisiana. This latter break seriously threatens the Louisville, New Orleans & Texas and the Illinois Central roads. Trains were moving over the Illinois Central at last accounts, but the other road suspended operations, the track being two feet under water. The Government engineers do not want to repair this break, as they claim it will relieve other levees from undue pressure. The losses suffered by the railroads as a whole, amount to large sums, but invidually their losses are not great. The worst losses will be from interruption of traffic and softening of roadbeds. This latter, though generally not very bad in any special locality is very extensive.

CHICAGO, May 18.—The only road open to St. Louis from the East, up to Wednesday, May 18, was the Vandalia, which ran its trains over the Merchants' Bridge. All lines that can make the connection run their trains over this road. The Alton has run a few trains into St. Louis by making connections over the Jacksonville Southeastern at Verden, or the Vandalia at Southboro. The Vandalia line is threatened, and may not be able to hold out much longer. Practically all the tracks at East St. Louis are now impassable. The Wabash has lost about two miles of lines near East St. Louis. The Atchison reports its lines clear east of the Missouri River, but there is much softening of track. The Burlington had two bad landslides Tuesday on the main line, near Plattsmouth, cutting off its western connections entirely. Telegraph lines are also down, and no details can be given. At Keokuk the Mississippi continues to rise, and threatens the Egyptian levee, protecting Alexandria, Mo. The Chicago, Milwaukee & St. Paul reports its lines in fair shape, and all trains running.

An Inclined Cable Railroad for Transferring Freight Cars.

The Western Brewery of St. Louis, more commonly known as Lemp's Brewery, is situated about 2,000 ft. from the tracks of the Iron Mountain Railroad, and at an elevation above the tracks of 95 ft. There is a continuous ascent from the Iron Mountain tracks to the brewery, the steepest grade along Potomac street, which connects the two, being $7\frac{7}{10}$ per cent. The regular freight cars are transferred between the lower yard and an upper yard, which was established on a level with the brewery buildings, by a road which was completed and put in operation in June, 1891, and since then it has been in constant use.

A hoisting engine, with a drum of a capacity sufficient to hold the whole length of the cable, is placed at the upper end of the incline. The upper end of the cable is fastened to the drum, and from there the cable passes underground, in a conduit placed between the rails, to the grip car to which the lower end of the cable is fastened permanently. The conduit is provided with a slot; through which the grip plate from the car passes.

To take the cars up hill, the grip car is placed at the lower end of the road, the freight cars are placed in front, and the train is started up the hill with the grip car at the lower end of the train. In going down hill the train runs by gravity, pulling the rope along. In either case the grip car is at the lower end of the train, so that the safety of the train is not dependent upon the couplings. Two loaded or three empty cars are transferred at each trip.

The cable road is built on a straight line with the exception of one curve at the lower end. This is a 35-degree curve (radius 166.3 ft). The lower end has a grade of 2 ft. per 100 ft., up to the beginning of the curve. In passing around the curve the grade is increased gradually. At the upper end of the curve the grade is seven and two-tenths per cent. for a distance of about 300 ft. From there it changes to 6.48 per cent. and then to 5.37 per cent. up to Broadway. At Broadway where the line crosses the tracks of the Broadway cable road, the line is level and from there it again changes to a 2.26 per cent. grade up to the upper end of the road.

The movements of the train are controlled entirely by the engineer of the hoisting engine. Electric signals are established between the hoisting engine and the grip car, so that the conductor on the grip car can, at any time, signal to stop, start or to go up or down. The electric wires for signaling, as well as for the operation of the safety stop device, to be described hereafter, are placed in the centre of the steel cable, the ordinary hemp core being replaced by an electric core.

The grip car is provided with attachments, which enable the conductor to stop the train at any time while going down hill. It is also arranged so that in case the cable breaks the safety device is applied through the breaking of an electric current passing in one of the wires in the core.

The cable track is formed by 85 lb. steel rails 5 in. high, resting upon cast iron yokes placed $3\frac{1}{2}$ ft. between centres. The slot rail is a Z-rail weighing 53 lbs. per yard. The conduit is formed of concrete which fills up the space between the yokes and extends to a depth of 10 in. below the bearing of the yoke under the rail. The conduit is 9 in. wide and 20 in. deep, measured from the top of the slot rail. The concrete is composed of two parts of Portland cement, five parts of river sand and ten parts of broken stone.

The yokes weigh about 500 lbs. each, and are designed so as to give ample bearing surface for the heavy loads which are carried, the construction being different from the ordinary yokes, especially in the large bearing provided directly under the rail. The rail joints are always made at the yokes.

The vertical sheaves are placed generally, at intervals of $31\frac{1}{2}$ ft. and are of cast iron with a chilled groove for the rope. The sheave is five inches in diameter and has a steel shaft with bearings of babbitt metal. The sheave moves in a cast iron fame resting on one side on a crossbar of the man-hole frame, and on the other side in a cast iron wall box.

The horizontal sheaves placed at the lower end of the line are $3\frac{1}{2}$ ft. apart. The sheave is of cast iron 14 in. in diameter and has a four-inch face. The shaft is of steel and rests upon a chilled cast iron button. The bearings are of babbit metal. The frame and sheave are introduced as a whole, and when in position the frame is bolted to flanges provided in the man-hole casting.

A depression sheave is placed at the upper end of the line. It is operated by means of a lever which is placed in the gate house in which the air pumps which operate the crossing gates are also located.

The drum of the hoisting engine, 12 ft. diameter, 6 ft. face, is connected to the large gear wheel by means of a friction clutch, and has a band friction brake, consisting of a wrought iron band lined with basswood blocks 10 in. wide and 3 in. thick, operated both by a hand lever and by a small steam cylinder, which latter is used only in case of emergency. An intermediate gear connects back to the pinion on the engine shaft. The engine has two cylinders 14 in. diameter × 15 in. stroke. One hundred and fifty revolutions of the engine gives a rope speed of 5 ft. per second, which is the ordinary speed of operation of the road. All of the levers for operating the drum and engine are placed on an elevated platform from which the operator has a view of the greater part of the line. The hoisting engine rests upon a foundation of brick laid in Portland cement mortar.

The grip car is fastened permanently to one end of the cable, the other end being fastened to the hoisting drum. The grip plate is of steel $\frac{3}{4}$-in. thick, and at its lower end is 9 in. wide. The lower end of the grip plate is forged into a bulb which is bored conically for the insertion of the cable. The electric core passes through the hollow steel wedge, and from there up into the car. The strands of the cable are wedged into the bulb by means of the hollow steel wedge.

The cable has six strands of 19 steel wires each, and its breaking load, as given by the manufacturer, being figured upon the combined ultimate strength of the individual wires, is 123,000 lbs. The ultimate strength of the wire used is 190,000 lbs. per sq. in. The maximum stress to which the cable is subjected in the operation of the road is about 15,000 lbs., not taking into account the increased stress that may occur, due to a sudden application of the load. The grip plate is hinged to the longitudinal car timbers, so as to allow for lateral motion.

The design of the safety stop device is as follows:

A trolley runs under the car on the slot rails and is attached to the car by means of two chains passing over the sheaves into the car. The other ends of the chains are attached to the piston cross-head. The piston operates in a cylinder filled with glycerine and water, the cylinder being bolted to the car body. A cast iron rack is riveted to the under side of the slot rail, and the trolley carries a rack of forged steel suspended below the slot rail by two straps which pass through the slot. The spring on the trolley tends to throw the trolley rack up into the position shown by the dotted lines, in which position it engages with the rack on the slot rail. A latch is inserted to prevent the spring from coming into action. If for any reason it is desired to stop the train suddenly, while going down hill, the conductor pulls a handle in the car which releases the latch on the trolley and allows the two racks to engage. The trolley then comes to a sudden stop, but the train travels on until the energy in the moving load is taken up in the cylinder, forming a cushion with a total motion of 4 ft. 9 in.

The piston is provided with four holes through which tapered plug rods pass, and when the piston moves, the valve on the by-pass pipe being closed, the water is forced through these holes in the piston. As the velocity of the piston decreases, the train being brought to a gradual stop, the openings through which the water is forced also decrease in size, being designed so as to give a constant velocity to the water passing through the openings. A constant velocity here means a constant pressure on the piston tending to retard it, and hence a constant force tending to stop the train.

The parts are so designed that with a load of 180,000 lbs. traveling down a $7\frac{7}{10}$ per cent. grade at the rate of 5 ft. per second, the train will be stopped in a distance of 4 ft., with a uniform tension on the chain of about 30,000 lbs.

The calculations are as follows:

Weight of 2 cars @ 80,000 lbs. ..... 160,000 lbs.
Weight of grip car ..... 20,000 "
Total load ..... 180,000 "

The energy of the moving load is

$$\frac{W v^2}{2g} = \frac{180{,}000 \times 5 \times 5}{6.44} = 70{,}000 \text{ ft. lbs.}$$

The additional energy developed while moving 4 ft. on the 7.2 per cent. grade is

$W \sin \phi \times 4 = 180{,}000 \times 0.072 \times 4 = 51{,}840$ ft. lbs.

Total energy to be absorbed = 121,840 ft. lbs.

Effective area of piston = 103 sq. in., requiring a pressure of 295 lbs. per sq. in., and a velocity through the holes in the piston

$v^1 = 8{,}025\, c \sqrt{h} = 8{,}025 \times 0.7 \times \sqrt{.878} = 146$ ft. per sec.

The area of the openings required is found by determining the velocity of the car at different points

$$a = \frac{F g}{W}$$

$$v = \sqrt{v_0^2 + 2 a d}$$

$$A^1 = \frac{A \sqrt{v_0^2 + 2 a d}}{v^1}$$

a = acceleration due to retarding force.

v = velocity of car; velocity of piston.

v^1 = velocity of water through holes in piston.

d = distance from the front at which the retarding force is applied.

A^1 area of openings in piston.

A = area of piston.

v_0 = velocity of car or piston when retarding force is first applied.

By substituting values for d, the required areas of opening at different points of the stroke are obtained.

$d = 0$ ft.	$A^1 = 3.53$ sq. in.
$d = 1$ ft.	$A^1 = 3.05$ "
$d = 2$ ft.	$A^1 = 2.50$ "
$d = 3$ ft.	$A^1 = 1.78$ "
$d = 4$ ft.	$A^1 = 0.00$ "

These varying areas are obtained by means of the conical plug rods which pass through the holes in the cylinder.

Shortly after the completion of the road this safety appliance was tested in the following manner: The grip car with two loaded beer cars, weighing in all about 170,000 lbs., were moving down on the $5^{32}/_{100}$ per cent. grade at the usual speed (about five feet per second) when the latch was pulled and the train came to a stop within the $4\frac{3}{4}$ ft. without any perceptible shock and without any damage whatever. They have used the safety appliance five or six times since the road was put in operation thereby preventing serious accidents.

To further provide against accident in case the cable should break, a magnet operated by an electric current passing through one of the wires in the electric core, is placed in the car. The magnet supports an armature weighing 22 lbs., and in case the current breaks, the armature drops upon a disc at the end of hand rope and pulls the latch of the safety device. The electric core contains two No. 16 copper wire conductors, each made up of four wires, and one similar steel wire conductor. Each strand is covered with tape and is thoroughly insulated. The outside diameter of the core is $\frac{5}{8}$ inch.

The upper end of the steel cable being fastened to the drum the electric core is brought down to the shaft of the drum and passed through a hole drilled longitudinally into the shaft, emerging at the end of the shaft, where the wires are attached to brass rings which are in contact with brushes, from which latter the wires lead to the bell and batteries. A long board with the ends resting upon springs is placed across the pit and just below the normal position of the cable. Electric push buttons are placed at either end of the board. The moment the cable becomes slack it rests on the board and an electric bell rings continuously until the engineer takes up the slack.

The total cost of the road, including hoisting engine, grip car, etc., was $58,500. The plans and specifications were prepared and the work was superintended by Johnson & Flad, consulting engineers, of St. Louis, Mo.

* Abstract of paper by Edward Flad, read before the Engineers' Club of St. Louis and published in the *Journal of the Association of Engineering Societies*.

TECHNICAL.

Manufacturing and Business.

The Chicago Car Seal Mfg. Co. has been chartered in Illinois to manufacture car seals. The incorporators are A. H. Pierce, J. H. Defrees, H. A. Ritter.

The Wason Car Works, Chattanooga, Tenn., have a large number of orders on hand. The works are so crowded that an addition is being erected.

Efforts are being made to reorganize the Spiral Weld Tube Co., of No. 43 John street, New York, whose works are at East Orange, N. J. The company was incorporated in 1887. The liabilities are reported to be $80,000. A committee of three has been appointed to reorganize the company, and it is expected that they will be able to do so.

The Track Signal Co., of Detroit, has been organized to manufacture the Parish track signal. The officers are Frederick P. Anderson, President; A. G. Boynton, Vice-President; Dr. Phil Porter, Secretary and Treasurer.

The Springfield Steel Casting Co., of Springfield, O., manufacturers of crucible steel castings, has decided to remove its plant to Lima, O. The Lima Steel Castings Co., with a capital stock of $50,000, has been chartered for this purpose. At Lima a 10-ton open-hearth steel plant will be built, equipped with the best modern appliances.

New Stations and Shops.

The New Orleans & Southern will erect a new roundhouse and a small machine shop at New Orleans near Hancock street as soon as the high water subsides.

The New York, New Haven & Hartford is building a large new freight house at Melrose, N. Y. The building will be triangular in shape and will cost about $150,000.

The Chicago & Northwestern will build a new passenger station on South Main street, Rockford, where it has recently purchased grounds at a cost of $33,000.

The officers of the Nashville Union Depot Co. have promised the citizens of Nashville, Tenn., that work will soon be commenced on a new Union station. They said that plans were prepared some time ago for a new passenger station south of Broad street, and for a new freight house on the site of the present Union depot.

The Southern Pacific will build at New Orleans a freight receiving and storage house, a four story brick structure, about 37 × 125 ft., and it will have four elevators. The company has contracted for the erection of a steel shed 250 × 125 ft.

The Forth Worth & Rio Grande will soon erect machine shops in Brownwood, Tex.

The West Shore and New York, Susquehanna & Western are to jointly build a brick and stone station at Little Ferry, N. J. The Central Railroad of New Jersey has plans made for a new station at East Thirty-eighth street, Bayonne, N. J. The New Jersey & New York will build a new station at Hackensack, N. J.

It is stated that the Charleston, Sumter & Northern will erect extensive machine shops at Sumter, S. C.

The machine and repair shops of the Queen & Crescent, Meridian, Miss., which were recently destroyed by fire, are to be rebuilt on a larger scale.

The plans for the proposed new station of the Boston & Maine, at Lynn, Mass., have been prepared, and work on the building will probably be commenced very soon, as the necessary ordinances have been secured from the Common Council.

Car Lighting.

Arrangements have been made to build Pintsch gas works at Council Bluffs and Kansas City, to supply the Union Pacific and allied lines. Works will also be built at Buffalo for the New York Central, Lake Shore, Michigan Central and West Shore.

The interesting announcement is made that Pullman cars lighted with the Pintsch gas are to be run from Chicago to San Francisco. The Pullman people have delivered to the Rock Island 15 cars for this through service. These, we believe, are the first Pintsch lighted cars ever run through to the Pacific in regular service. The rapid extension in this country of this system of car lighting is indicated by the following figures: On Jan. 1 the total mileage of track over which Pintsch lighted cars were running was 2,129 miles; Jan. 1, 1890, it was 7,049 miles; Jan. 1, 1892, it was 45,305. As we have frequently said, the extension of this method of car lighting will go on with accelerated ratio, as more and more plants for making and compressing the gas are established, and as railroad men become more familiar with it. We have lately seen a letter from a general manager who was, until recently, quite strongly opposed to this system. He says now: "I think there should be a law requiring every sleeping car to be equipped with it, the heat and danger of oil lamps are so great, especially in summer," and he is urging the Pullman Co. to put it on all cars that are to be run over his line. The American Company and Mr. Julius Pintsch, of Berlin, will make an elaborate exhibition of this system for lighting cars and buoys at the World's Fair.

Car Ventilation.

A trial was made on Saturday last of the Creamer system of ventilation on the Boston & Maine in a run from Boston to Lawrence and return. About 20 officers from the different roads centering in Boston were present. Among them D.W. Sanborn, General Superintendent; J. T. Chamberlain, Master Car Builder of Boston & Maine; Mr. Lauder and Mr. Twombly, of the Old Colony; Mr. Marden, of the Fitchburg, and others. Every one seemed satisfied with the results shown and predicted success for the improvements, a description of which has already been published in these columns.

Switching by Electricity.

Inspector Brettman, of the Prussian state Railroads, writes to the *Deutsche Bauzeitung* to suggest the use of electric power for switching cars, and calls attention to the high cost of switching by locomotives. The annual statement for the fiscal year 1889-90 showed that the switching on the Prussian roads required over 10,000,000 locomotive-hours, the fuel alone costing $1,500,000. On adding to this the wages of the engineers and firemen it appears that 19 per cent. of the cost of the train service is spent on the switching. Inspector Brettman thinks a cheaper and more serviceable motive power can only be found in electricity, which will soon make its way into railroad stations for lighting purposes. He thinks of so arranging electric capstans between the tracks that several may be used simultaneously for moving a heavy train, while one would suffice for a few cars. In certain cases he would advise the use of motor cars with gears engaging a rack alongside of the track, these cars being moved from track to track on a sliding platform or turntable. It is evident that the range of travel of a switch engine is very small as compared with even a horse car, and therefore it is not so much the cost of the long transmission lines, as the feasibility of operating motors on zig-zag tracks, which will govern the use of electrical energy for this purpose.—*Electrical Engineer.*

Jewett Anti-Friction Devices.

The Boston & Albany is using the anti-friction centre plates and side bearings devised by Mr. Jewett, on all new passenger cars. The company now has them running on about 30 cars. It is believed that there is a great saving in flange wear, rail wear and motive power; it is also observed that the shocks to high speed trains on entering and leaving curves are diminished.

A Car Coupler Accident.

On May 12 a freight train was wrecked on the New York & New England Railroad through the pulling out of a M. C. B. coupler. It was a Thurmond coupler on a coal car. It had a 2-in. spindle with a slot large enough for a ⅝ × 2 in. key. The key was either lost out or broken. The train was running west, and the coupler which pulled out was on the east end of the car. It dropped on the track and several cars were derailed.

Locomotive Test of the Memphis Bridge.

Loading the anchorage span with four locomotives. Result: The anchorage span was depressed $\frac{1}{16}$ in.; the last intermediate span was elevated ¼ in.; no effect on other spans.

Eighteen locomotives on the intermediate span covering whole distance between piers I and II. Result: The anchorage span was elevated $\frac{5}{16}$ in.; depression of the intermediate span, 4⅝ in.; elevation of the central span 2⅛ in.; depression of the west intermediate span, $\frac{5}{16}$ in.

Four locomotives on the anchorage span and 14 on the central span. Result: Intermediate span elevated 1¼ in.; central span depressed 2⅛ in.; west intermediate span, 1⅝ in.

East and west intermediate spans, half loaded. Result: Anchorage span elevated ¼ in.; intermediate span depressed 3½ in.; central, elevated 2 in.; intermediate, depressed 3⅝ in.

West intermediate, loaded with 14 locomotives. Result: No effect on the anchorage span; east intermediate span depressed ¾ in.; central, elevated 1 in.; west intermediate, depressed 2⅝ in.

The Cornell Dam.

The New York Aqueduct Commissioners have adopted the report in favor of the Cornell dam. Bids have advertised for and will be opened June 15.

Broadway Cable Machinery.

The Walker Manufacturing Co., of Cleveland, O., is just completing a huge pulley for the works of the Broadway Cable Railroad in New York. It is 32 ft. in diameter, and is designed to carry 34 2-in. cables on its face, which is 100 in. wide. Its weight without the shaft is 104 tons. It is one of four built by this company for the Broadway Railroad.

Westinghouse Electric Company.

The annual meeting of the Westinghouse Electric & Mfg. Co., the first since the reorganization, was held at Pittsburgh, May 18, and the following directors were elected: Charles Francis Adams, Lemuel Bannister, August Belmont, A. M. Byers, N. W. Bumstead, Marcellus Hartley, George W. Hebard, Henry B. Hyde, Brayton Ives and George Westinghouse, Jr. The only change was the election of Mr. Bumstead in place of Charles Fairchild. The president's report shows aggregate sales for the 14 months ending with March 1, 1892, of $3,468,900, and during the months of March and April under the reorganization of $1,576,235. The company now employs 1,600 men.

Fire Test of the "Frost" Carbureter.

On Friday, May 13, the Railroad Lighting & Manufacturing Co., of Philadelphia, through their Western representative, made a "fire test" of their carbureter, similar to those made some time ago at Altoona by the Pennsylvania Railroad. A new round carbureter (old style) was mounted on an iron frame, connected as it would be upon a car, with air supply pipe, safety valve, gauges, check valve, etc. The carbureter was charged with five gallons of oil, this being from one to one and one-half gallons more than a new carbureter is usually charged with. A fire made of four full barrels of pine wood was started under the carbureter. As in former fire tests made with the carbureter, there was no explosion. The safety valve relieved all pressure in excess of 5 lbs. due to the great heat, until the fire melted the soldered joints, which allowed the gas to escape through the seams and be consumed. The test showed that the carbureter would not explode when surrounded by fire, even if excessively over charged.

The Chicago Elevated Terminal Commission.

The Elevated Terminal Commission handed in its report to the Mayor of Chicago, who approved of it, and it was presented to the Council Monday night, May 16. The Council dismissed the Commission and accepted its report. The report reviews the means adopted by the Pennsylvania Railroad in Philadelphia and Jersey City and the Reading at Philadelphia for elevated terminals. The Commission seems to favor the Pennsylvania's Philadelphia terminal. The report also contains much information and statistics from the Boston Rapid Transit Commission, also from reports on the operation of the elevated railroads in Berlin. The conclusion reached is that it is entirely practical to elevate the tracks in Chicago. A second report on the subject of raising the Northwestern switch tracks at Rush street contains maps and diagrams and estimated costs of this change, and shows its practicability. The Commission was preparing another report on the elevation of the St. Charles Air Line that crosses the two cable surface roads and Michigan boulevard, and also another on the Lake Shore tracks to the Stock Yards at Fortieth street. There is some political significance in the dismissal of the Elevated Terminal Commission. The Mayor, on Saturday last, discharged a great number of supernumerary city employés without consulting the wishes of the Aldermen, and this may have had a disturbing effect. The ordinance providing for the elevation of the Illinois Central was up for consideration before the Council but was not voted on, being put aside after a few objections and amendments were offered.

THE SCRAP HEAP.

Notes.

The New York Central has placed a number of anthracite-burning locomotives on the passenger trains of the Hudson River Division.

The annual convention of the Brotherhood of Locomotive Engineers is in session at Atlanta, Ga. The Brotherhood now has 32,000 members.

About 150 men in the car shops of the Southern Pacific at Sacramento recently struck because they were ordered to work under the piece-work system.

The Cambria Iron Co., of Johnstown, Pa., which operates several miles of railroad, has discharged about 30 trainmen because they belonged to a Brotherhood.

In Huntington County, Pennsylvania, last week, a man who had attempted to wreck a passenger train on the Pennsylvania Railroad was sentenced to seven years' imprisonment.

At the annual meeting of the American Ticket Brokers' Association, held in Denver last week, W. W. Willoughby, of Denver, was elected President, and W. B. Caster, of Louisville, Secretary.

The plans for abolishing grade crossings in Buffalo, which were adopted by the special commission to consider that question, are now being sharply criticised by a newly formed Citizens' Association in the southern part of the city.

A 20-acre tract of land just outside the southeast corner of the World's Fair Grounds at Chicago has been leased for a railroad terminal to be used, it is said, by the Lake Shore & Michigan Southern and the Pennsylvania lines. It is said that the trains of these roads will reach this point over the South Chicago Branch of the Illinois Central.

Spanish American Notes.

The last of three light draught steamboats, to be used on the Magdalena River, Colombia, has just been completed at Pittsburgh.

A company has been formed in Colombia for the navigation of the Bogota River between Puenta Grande and Engitava, and one steamer has already been put into service.

At the suggestion of the Brazilian government a number of the railroads in that country have decided to close their yearly accounts hereafter at the end of the year, to conform with the fiscal year of the government.

The Nicaragua & Atlantic Railway, which is to connect Rame, near Bluefields, with San Ubaldo and Managua will be commenced during the present year. The surveys have been completed and a contract for the first section has been signed.

The government of Colombia has let a contract to Messrs. Punchard McTaggart, Lowder & Co., of London, for the continuation of the Antioquia Railroad from Puerto Berrio to Medellin. A commission of engineers has been sent out to draw up final plans for this work.

The Attorney-General of Argentina has reported against the legality of the proposed provincial tax on railroads. The provincial government of Buenos Ayres had decreed a tax of five cents on every ticket sold, irrespective of distance, which was calculated to yield $3 0,000 a year.

The cables have been manufactured and shipped which are to complete the connection between Pernambuco, Brazil, and St. Louis, Senegal. The line will be the property of the South American Cable Co., which exists

under concessions from France and Brazil and is capitalized at $2,500,000. The cable touches at the island of Fernando de Noronha, and the Senegal end is already in operation. The steamship Silvertown, which has gone out for this work, is expected to land the Brazilian end of the cable by July next.

The promoters of the Ecuador National Railway have made satisfactory arrangements with the government, and the contract will be signed in London upon the arrival of the Ecuadorian Commissioner. Under the new arrangement the 5 per cent. bonds of this road and the 6 per cent. bonds of the Guayaquil are to be exchanged for new bonds at the rate of 430 francs and 432½ francs respectively for each 500 francs. The bonds will be paid in 36 years, and for the period of 33 years they will be guaranteed by the government to the amount of 12,800,000 francs. The National Railway will now be extended, and it is understood that it will receive strong support in England.

World's Fair Notes.

Most of the World's Fair buildings will be tinted a pale ivory.

The aggregate of the appropriations for 45 nations and 31 colonies and provinces that have accepted the invitation amounts to $4,646,895, there being yet 30 to hear from.

The New York State building will be one of the most artistic and commodious state buildings in the grounds. The plans which have been approved show a building two stories high, covered with staff to represent marble, and estimated to cost between $80,000 and $100,000.

Mr. Willard P. Tisdel, the World's Fair Commissioner to South America, writes that the people of Peru are beginning to take much interest in the Exposition, and that a liberal appropriation will be made. A local exposition will be held in Lima in July and August, and the best of things exhibited there will be sent to Chicago. While the mineral exhibit will be the principal feature of the display from Peru, there will also be sent cotton, alpaca, wool, tobacco and petroleum.

Lieut. Lemly reports from Bogota that the Commission appointed by the Government of Colombia has sent out a representative through the mining districts of Antioquia and Tolima to make a collection of mineralogical specimens for the Chicago Exposition. The commission has also bought a most valuable and complete collection of native birds belonging to Mr. Carlos Belen, which will be sent, and there is no doubt that a fine collection will be selected from the National Museum.

For the Engineering Congress, to be held under the auspices of the World's Congress Auxiliary, in Chicago, there has been raised $10,000 of the $15,000 estimated to be necessary for its expenses. This congress will probably be one of great scientific importance. Chairman Corthell, of the general committee, gave invitations to 36 and received acceptance from 27 engineering societies. From the remainder no word has been received and there were no declinations.

The Pennsylvania Railroad has asked for 39,000 sq. ft. of space outside of the Transportation Building. Street car concerns have asked for 40,000 sq. ft. also outside. The application for space in the Transportation Building exceeds by 54,423 sq. ft. that available, and many more applicants are expected. In the Department of Machinery the hall is found too small by 329,867 sq. ft., that being the amount of the applications in excess of the unassigned space. A request has been made by the chief of that department, Lieut. Robinson, for a special building for machinery exhibits requiring fires. There is some talk of a separate structure for liberal arts, as the great manufactures building will not properly accommodate them.

A Silver Pass.

In the matter of annual passes Mr. Otto Mears, President of the Rio Grande Southern and Silverton Railroads, adds a charm to the "favor" he bestows by making it a work of art. It is of sterling silver, Mexican filigree work, of which a very fair idea can be had from the fac-simile engraving. The plate is about 1½ in. × 2¾ in., and the solid rim is ⅛ in. thick. The small plate in the centre bears, in raised letters, the autograph of President Mears, the name of the recipient being engraved.

The names of the two railroads are in solid raised letters on the filigree work. This is the only pass in metal issued in this country, so far as we know. The Metropolitan Elevated formerly issued an "emblem of rapid transit" to directors and higher officers, a wheel and wing of gold and platinum, but these have not been used in late years.

A Locomotive Boiler Explodes.

On May 10 the boiler of a Burlington & Missouri River freight engine exploded, killing Engineer Rhinehart and Fireman Wilson, and fatally injuring Brakeman Nelson. The train was running at the rate of 35 miles an hour when the accident occurred.

LOCOMOTIVE BUILDING.

The Schenectady Locomotive Works have just finished two 10-wheel locomotives, Mogul type, for the Adirondack & St. Lawrence.

The Ohio & Mississippi has ordered 15 10-wheel consolidation locomotives and 5 switching engines from the Rhode Island Locomotive Works.

The Staten Island Rapid Transit road has ordered four simple engines from the Baldwin Locomotive Works of Philadelphia, to be delivered in July.

The Great Northern has ordered from the Baldwin Locomotive Works seven consolidation compound locomotives of the Vauclain type. Of these five will be for freight and two for passenger service.

CAR BUILDING.

The St. Louis, Vandalia & Terre Haute is asking bids for building 10 passenger cars.

The Savannah, Florida & Western will order 300 fruit cars similar to the 500 received some time ago.

The New York Central & Hudson River road has just put in service on the Hudson River division 100 new passenger cars.

Two new vestibule smoking cars for the Adirondack & St. Lawrence have been built at the Gilbert car works, Green Island, N. Y.

The Jacksonville & Southeastern has given the Missouri Car & Foundry Co., of St. Louis, orders for 100 fruit cars, 100 furniture cars and 100 box cars.

The New York, Ontario & Western has let an order for 500 gondola cars to the Peninsular Car Co., of Detroit. The delivery is to begin in June and completed by Aug. 15.

About 1,600 men are now working at the Wagner Palace Car shops at East Buffalo, and this force will probably be employed up to October. Between 10 and 12 new cars are being completed monthly, in addition to the usual heavy repair work.

The Chicago & South Side Rapid Transit road received last week 25 cars for its elevated line. They are similar to those used on the Manhattan Elevated in New York, but with wider platforms. Each car is 40 ft. long, and the platforms are 3½ ft. wide.

The Staten Island Rapid Transit has given an order to the Jackson & Sharp Co., of Wilmington, Del., for 24 new cars. Twelve of them will be first class suburban cars, eight excursion cars and four combination cars. The contract calls for their delivery in July.

The Burton Stock Car Co. is having built at St. Louis 1,000 feeding and cattle cars at a cost of about $700,000. The company's shops at Wichita and Chicago are full of orders, which accounts for this placing of contracts with outside builders. The Laconia Car Co. will also build 100 commercial horse cars under contract for the Burton company. The outside builders take part payment in bonds of the Burton company, and the cars will be run under a car trust plan.

BRIDGE BUILDING.

Augusta, Ga.—The Georgia railroad is asking for bids for the construction of the bridge across the Oconee River, near Carey, Ga., comprising three spans of deck plate girders, 74 ft. long and 5 ft. deep.

Baltimore, Md.—The Baltimore Belt Railroad will construct a timber and iron bridge 40 ft. wide over the railroad excavation beyond Fifth street and parallel to Hampden avenue and Prospect street.

Cascade County, Mont.—The Shiffler Bridge Co. has recently completed two 119-ft. through highway spans for Cascade County, Mont., for which M. S. Parker, of Great Falls, Mont. is Consulting Engineer.

Chelsea, Mass.—The Boston & Maine proposes to build a new iron bridge in place of the present Chelsea bridge at a cost of $270,000. The bridge will be in three sections, and including approaches will be 1,935 ft. long.

Chicago.—The Illinois Central is about to let a number of contracts for iron and steel bridge and structural work. Contracts have already been placed with the Kenwood Bridge Co. of Chicago for the large train shed at New Orleans, weighing about 700,000 lbs., to the Union Bridge Co. for a lattice girder draw span, and to the Keystone Bridge Co. for smaller bridge work.

Cincinnati, O.—The Cincinnati, Hamilton & Dayton has recently awarded contracts for bridges as follows: To the Detroit Bridge & Iron Works, a 350 ft. trestle with plate girders alternating 58 and 20 ft. long, 12 plate girder spans 60 ft. long each, and one 25 ft. and one 20 ft. long; to the Smith Bridge Co. of Toledo, O., a 160 ft. through, pin-connected, twin span; and to the Massillon Bridge Co., of Massillon, O., a plate girder span 65 ft. long. This covers practically all the bridge work to be done this year by this company.

The Cincinnati & Covington Bridge Co. is preparing new specifications for its bridge across the Ohio River, to meet the objections raised by the Secretary of War against the present plans. The length of the span on the Kentucky side will be increased from 500 to 850 ft.

Cohoes, N. Y.—The Hilton Bridge Co., of Albany, N. Y., is to construct an iron foot bridge across the Champlain Canal at Cohoes.

Cumberland, Md.—The West Virginia Central has recently let contracts for about 600 tons of bridge work to the Shiffler Bridge Co. of Pittsburgh, the Youngstown Bridge Co., of Youngstown, O., and the New Jersey Steel & Iron Works of Trenton, N. J.

Delaware County, Pa.—The County Commissioners have awarded the contract for the erection of the proposed iron bridge over Fourth street, in Chester City, to the Berlin Bridge Co., of East Berlin, Conn., for $29,000. The bridge will have a span of 140 ft., with a 40-ft. wide roadway and footwalks on each side, nine ft. wide.

Fargo, N. D.—The County Commissioners are preparing plans for a bridge over the Red River north of the city.

Florence, Ala.—The Alabama Railroad Commissioners have condemned the railroad bridge across the Tennessee River at Florence, used by the Memphis & Charleston, and have recommended the erection of a new iron structure.

Harriman, Tenn.—The contract has been let for the construction of an iron bridge across the Emory River to cost about $14,000.

Little Rock, Ark.—The Little Rock & Ft. Smith has contracted with the Detroit Bridge & Iron Works for 12 spans of iron bridge work of varying length.

Macon, Ga.—An iron bridge is being built at the Fourth street crossing of the Central of Georgia, in South Macon. It is to have a 50 ft. roadway, with two sidewalks each 20 ft. wide, and the height of the bridge is 20 ft. It is to cost $10,000.

Memphis, Tenn.—The Memphis & Charleston Railroad is in the market for bridge work.

New Brunswick, N. J.—Work will be begun in a few days on the new stone arch bridge to be erected across the Raritan River at Albany street, New Brunswick. Dean & Westbrook, of New York, the contractors, say they will have the bridge finished by next Christmas. It is again reported that the Pennsylvania has let the contract for a new iron bridge across the Raritan River at New Brunswick. This report was denied, when circulated, during the winter.

Oil City, Pa.—The Princeton Bridge Co. has been chartered in Pennsylvania with a capital of $5,000. The new bridge will cross Oil Creek at Sycamore street, in Oil City. The incorporators are John B. Smithman, Nelson H. Brown, David Laughlin, Edward S. Laughlin and Emanuel M. Wolfe.

The Seneca Bridge Co. has been chartered to construct bridges across the Allegheny River at Oil City.

Owego, N. Y.—The Owego Co., of Owego, N. Y., has already made contracts for building six or eight bridges, on which work will be commenced as soon as the machinery is all in place. The work of fitting up the plant is gradually approaching completion, and the manufacture of iron bridges will be commenced in about two weeks' time. Some of the machinery is already in place, and the remainder will arrive within the next few days.

Oxford, Neb.—The County Commissioners of Harlan and Furnas counties, Neb., have decided to build a new iron bridge across the Republican River at Oxford, and the site of the structure will soon be selected.

Philadelphia.—The Common Council and the Pennsylvania Railroad will probably build a new bridge over the Schuylkill River, at Gray's ferry, to replace the present structure. The plan is now under consideration.

Phœnix Bridge Co.—The company has secured large contracts for bridge work from the Southern Pacific system that will keep the shops busy for several months.

Rochester, N. Y.—Proposals will be received until May 23 for the construction of the superstructure of the Clarissa street bridge, and for the repair of the masonry piers, and for the removal of the the fallen spans of the old bridge.

City Surveyor McClintock has completed the preparation of the ordinance for the Court street bridge, and it will be introduced at the council meeting this week. The estimate for the bridge, which is to be of stone, is $135,000. The stone work for the arch is estimated at $37,442; piers and abutments, $26,325, and the iron girder span over the canal, $18,000.

St. Augustine, Fla.—The St. Augustine Bridge Co. has been incorporated by W. W. Dewhurst, Matthew Hays, Allen Wood and others to build a toll bridge between St. Augustine and Anastasia Island. The capital stock is $50,000.

St. Charles, Mo.—The bill introduced in the House authorizing the construction of a wagon and motor bridge over the Missouri River at St. Charles has passed the Senate with amendments. The original bill authorized J. A. L. Waddell, of Kansas City, and others to construct the bridge. The Senate has amended it so as to grant this authority to the Occidental Bridge Construction Co., incorporated under the laws of Missouri.

St. Louis, Mo.—The Missouri, Kansas & Texas has let the contract for all iron and steel bridge work for this year to the Pencoyd Iron Works. This covers about 1,400 tons of material and includes some 22 spans of varying character and lengths.

Sutton, W. Va.—The County Court of Braxton County, W. Va., has issued an order appointing J. S. Hyer and E. S. Bland special commissioners to arrange for the erection of a large steel bridge over Elk River near Sutton in that county. The bridge will be over 300 ft. in length, with stone piers and three spans. These are the commissioners appointed by the same court a few weeks ago, for the location and erection of other bridges.

Union Bridge Co.—The company has recently secured contracts for the following work: Eighteen heavy roof trusses for a new foundry for the Buffalo Cast Iron Pipe Co.; four spans of plate girders for the Northern Central; a heavy girder for a traveling crane to be built by William Sellers & Co. for the Calumet & Hecla Mining Co.; and 15 spans of bridges of varying character and length for the Evansville & Terre Haute.

Washington, D. C.—The Engineer Commissioner for the District of Columbia has awarded the contract for the plate girder bridge across the canal at K street, for which proposals were recently asked, to the Youngstown Bridge Co.

The President has approved the act authorizing the construction of a bridge across the Osage River, near Warsaw, Mo., and the act for a bridge across the Missouri River at De Witt, Mo.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Columbus, Hocking Valley & Toledo, semi-annual, 2½ per cent., on the preferred stock, payable July 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 24.

Canada Southern, annual, New York City, N. Y., June 1.

Chicago, Burlington & Northern, annual, La Crosse, Wis., June 8.

Chicago & Eastern Illinois, annual, Chicago, Ill., June 1.

Chicago & Northwestern, annual, Chicago, Ill., June 2.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 4.

Des Moines & Fort Dodge, annual, Des Moines, Ia., June 2.

International & Great Northern, special, Palestine, Tex., July 14.

Kansas City & Omaha, special, Fairfield, Clay Co., Neb., May 25.

Keokuk & Des Moines, annual, Des Moines, Ia., June 1.

Manchester & Lawrence, annual, Manchester, N. H., May 27.

Milwaukee, Lake Shore & Western, annual, Milwaukee, Wis., June 3.

Minneapolis, St. Paul & Sault Ste. Marie, annual, Minneapolis, Minn., June 7.

Minnesota Transfer, annual, St. Paul, Minn., June 8.

New York & New England, annual adjourned, Boston, Mass., May 31.

New York, New Haven & Hartford, special, New Haven, Conn., May 26.

New York, Providence & Boston, special, Providence, R. I., May 25.

Paducah, Tennessee & Alabama, special, Puducah, Ky., June 15.
St. Joseph & Grand Island, annual, Elwood, Kan., June 14.
St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 6.
St. Louis, Iron Mountain & Southern, special, St. Louis, Mo., May 27.
St. Paul & Northern Pacific, annual, New York City, N. Y., June 1.
St. Paul & Sioux City, annual, St. Paul, Minn., June 4.
Superior Short Pine, annual, St. Paul, Minn., June 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Association of Railway Accounting Officers* will hold its fourth annual meeting at the Auditorium Hotel, Chicago, Ill., May 25.

The *American Institute of Electrical Engineers* will hold its next annual meeting at the Grand Pacific Hotel, Chicago, Ill., June 6.

The *American Society of Civil Engineers* will hold its next annual convention at the Hygeia Hotel, Old Point Comfort, Va., June 8.

The *Master Car Builders' Association* will hold its annual convention at Congress Hall, Saratoga Springs, N. Y., June 15.

The *American Railway Master Mechanics' Association* will hold its annual convention at Congress Hall, Saratoga Springs, June 20.

The *American Association of General Baggage Agents* will hold its next annual meeting at Mackinac Island, Mich., July 20.

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston Mass., on the second Monday of each alternate month commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November. By special resolution the next meeting will be held in April.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Engineers and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

American Institute of Electrical Engineers.

The annual meeting and election of the American Institute of Electrical Engineers was held at its headquarters, No. 12 West Thirty-first street, New York, May 17. The report of council showed the membership to be 615, a net increase of 74 over last year. The following officers were elected: President, Frank J. Sprague; Vice-Presidents, A. E. Kennelly, Nikola Tesla, Oscar T. Crosby; Managers, Charles Wirt, Angus S. Hibbard, Dr. Michael I. Pupin, Charles P. Steinmetz; Treasurer, George M. Phelps; Secretary, Ralph W. Pope. The officers holding over from last year are as follows: Vice-Presidents, T. D. Lockwood, Carl Hering, W. J. Hammer; Managers, J. C. Chamberlain, P. B. Delany, H. A. Foster, H. Ward Leonard, Dr. Louis Bell, Herbert Laws Webb, Prof. A. C. Compton and James Hambet. The general meeting of the Institute will be held at Chicago, June 6, 7 and 8.

New England Railroad Club.

The subject for discussion at the May meeting was the Rules of Interchange. A large part of the evening was occupied by an address by Mr. Frank H. Forbes, giving personal reminiscences of early railroad days in Massachusetts. The address is long, probably about 6,000 words, and we shall not attempt to give any abstract of it, but it was full of very interesting reminiscence.

New England Water Works Association.

The eleventh Annual Convention will be held at Holyoke, Mass., June 8 to 10. The headquarters will be at the Hotel Hamilton.

New York Railroad Club.

The regular April meeting was given up to topical discussions. Mr. C. H. Dale described briefly the Empire car coupler, illustrations of which appeared in the *Railroad Gazette* last week.

Mr. West brought up a question concerning defect cards. His company carded a car going to the New York Central. When the car came back the card had been removed and the repairs had not been made. The question arose as to accepting this car without a card. Supposing the card should come back in six months, would the New York, Ontario & Western be required to pay for repairs that had not been made? Mr. Adams (B. & A.) said that it was no uncommon thing for cars to go back and forth with the cards gone, and he was satisfied that they were often torn off by boys and persons not interested. The President said that it was common for cars to be repaired and the cards not removed. Mr. C. A. Smith asked if an inspector or a joint inspector puts a defect card on a car should it be binding? It has often been his experience that people say the card was only put on to get the car through. He suggests that the car should be marked "old defect" if that is the case. The President said that the reports of the Arbitration Committee would settle this question.

The question of leaky flues was then brought up by the President. Mr. West said that some of the difficulties of which he had spoken in the last discussion on this topic had been done away with by putting a dead plate in the front of the firebox. He says "we are now able to run the flues almost as long again by covering about 20 in. of the grates in front." Mr. Mitchell said that the Erie had used this plate for several years, making it 14½ in. wide. Mr. West had not been able to get the same results by putting a brick arch close to the flue sheet. The exhaust will pull up the fine coal and choke the flues below the level of the top of the arch. The President and Mr. Lewis confirmed the experience of the other gentlemen in this respect. There was considerable further discussion on this subject and other matters closely allied.

The question of roller bearings was then taken up. Mr. Adams said that the B. & A. has one car fitted with the Meneely bearings, which is doing very well. Their first experience was a failure, as the rollers crushed. The present set of bearings has been running three or four months very successfully, and he has heard no complaint. He is very skeptical, however, as to the value of any such device in railroad service, as the advantages of it are only felt at low speeds. There was considerable discussion on this subject, all of it, however, quite inconclusive, the general sentiment appearing to be that, while such bearings might be useful in reducing resistance at the start, their value at high speeds would be so slight as not to compensate for the increased first cost and cost of maintenance.

The Civil Engineer's Club of Cleveland.

The regular meeting of the club was held May 10 in the club rooms. Five active and one associate member were elected. Dr. Staley, President of Case School of Applied Science, was elected delegate to the Fifth International Congress of Inland Navigation. Mr. C. W. Hopkinson read a paper on "Whither Is Our Architecture Tending." Mr. Searles, a member of the club, one of the engineers of the North River bridge at New York, gave a very interesting account of the proposed structure.

PERSONAL.

—Mr. W. T. Barnard has been elected President of the Chicago & South Side Rapid Transit (Alley) elevated road, succeeding the late Col. Goddard.

—Mr. A. S. Garretson has been elected President of the Sioux City & Northern and the Sioux City, O'Neil & Western, vice Mr. F. C. Hills, resigned on account of ill health.

—Mr. Leland Wadsworth, who has been Assistant Superintendent of the Rome, Watertown & Ogdensburg, has resigned, and will enter the service of the Adirondack & St. Lawrence.

—Mr. W. S. Jones, Chief Engineer of the Chicago & Northern Pacific, has resigned. The road will hereafter be included in the jurisdiction of Chief Engineer Kendrick of the Northern Pacific.

—Mr. M. Summers, General Roadmaster of the Texas & Pacific, and Mr. W. E. Doyle, Division Roadmaster, have resigned. The office of General Baggage Agent, formerly held by Mr. W. L. Bass, has been abolished.

—Mr. T. H. Fennell, for 17 years Roadmaster for the Delaware, Lackawanna & Western, has been appointed Superintendent of the Buffalo Division of the Lehigh Valley, to succeed Mr. Edgar Van Etten, resigned.

—Mr. William F. Berry, for several years General Freight Agent of the Boston & Maine, was this week appointed General Traffic Manager, a new office. Mr. Berry was formerly Assistant General Freight Agent of the road.

—Mr. Thomas Aldcorn has resigned his position as Division Master Mechanic of the West Shore Railroad to accept the position of Mechanical Superintendent of the Empire Car Coupler Co., with office at 15 Warren street, New York.

—Mr. Charles P. Moone, Chief Engineer of the Chicago & New Orleans, died at Farina, Ill, May 15 after a brief illness. Mr. Moone had been engaged for a number of years as chief engineer in the survey and construction of lines in the Eastern and Southern States.

—Mr. C. A. F. Morris has been elected Building Inspector of St. Paul, Minn. Mr. Morris was for a number of years Chief Engineer of the St. Paul & Duluth, and recently was connected with the engineering department of the Great Northern.

—Mr. John E. Henry died at Des Moines, Ia., May 8, aged 73 years. He constructed part of the Rock Island road in Illinois in 1851, and served as its Superintendent untill 1854. He was afterward engaged in railroad construction in Iowa and was at one time Receiver of the Des Moines Valley road.

—Mr. Daniel Ripley has been appointed Traffic Manager of the Houston & Texas Central. Mr. H. A. Jones, who has been Assistant General Freight Agent, succeeds Mr. Ripley as General Freight Agent of the road, and of the Galveston, Harrisburg & San Antonio, of which Mr. Ripley has been Traffic Manager.

—The late Senator John S. Barbour, of Virginia, was for many years President of the Virginia Midland road and only resigned the office to enter the Senate. In 1852 he was elected President of the Orange, Alexandria & Manassas Railroad and served in that capacity until that road was merged in the Virginia Midland Railroad, when he was made President of that road.

—Col. H. C. Cross, President and General Manager of the Missouri, Kansas & Texas, resigned at the annual meeting this week. Officers will be elected in New York, May 24, and it is believed that Mr. H. C. Rouse, Chairman of the Board of Directors, will be elected President. Colonel Cross has been President of the company since its reorganization and was formerly Receiver.

—Mr. C. F. Ressigue has been appointed Division Superintendent of the Atchison, Topeka & Santa Fe, to succeed Mr. J. H. Parsons, resigned. He has been Superintendent of the Nebraska Division of the Union Pacific, and also had charge of the Mountain Division. Before Mr. Parsons left Wichita for Chicago, which is to be his home, the employés presented him with a handsome gold watch and chain.

—It is authoritatively stated that the report of the resignation of A. M. Tucker, General Manager of the New York, Pennsylvania & Ohio, and the Chicago & Erie, on account of ill health, is without any foundation. In the first place Colonel Tucker is in perfect health, and, secondly, the Erie or any other road which had his services would be very unwise to lose them, as he is one of the most conscientious and capable officers in the country.

—Mr. W. G. Pearce has been appointed Assistant General Manager of the Northern Pacific in addition to his present duties of General Purchasing Agent. Mr. Pearce first entered the railroad service in 1877 in the auditing department of the Missouri, Kansas & Texas. In 1879 he entered the service of the Northern Pacific, and in 1884 was appointed auditor of the disbursements, which position he occupied until February, 1890, when he was appointed General Purchasing Agent for the same company.

—Mr. George Dole Wadley, who has been appointed General Superintendent of the Central of Georgia is the third son of the late Col. W. M. Wadley, for a long time President of the road. He is now about 35 years of age. Mr. Wadley entered the service of the Central in 1883, in building the extension of the system in South Carolina, and on the completion of that work he was made Roadmaster of the old part of the Columbus & Western, and Superintendent of Construction of that portion from Goodwater to Childersburg, Ala. He resigned that position to go to the Mexican National as Division Engineer, and built 375 miles of that road. On leaving Mexico Mr. Wadley was made a division superintendent of the Louisville & Nashville system in 1889, but left it to accept the post of General Manager of the Kentucky Union. He resigned that position and was shortly afterward made Chief Engineer and General Manager of the South Bound road, from Savannah to Columbia, S. C.

—Mr. Edwin M. Herr, Master Mechanic of the Chicago, Milwaukee & St. Paul at West Milwaukee, has been appointed General Superintendent of the Grant Locomotive Works at Chicago, commencing June 1. Mr. Herr is 33 years of age. He commenced railroading early in life on the Kansas Pacific as telegraph operator for a construction gang, graduated from the Yale Scientific School in 1884, and during the summer vacations worked in the Pennsylvania Railroad shops at Altoona. On leaving college Mr. Herr was first a special apprentice in the Chicago, Milwaukee & St. Paul shops at West Milwaukee; then draftsman on the Chicago, Burlington & Quincy, and became Engineer of Tests, assisting at the air-brake trials at Burlington in 1886. Later, Mr. Herr was promoted to be Superintendent of Telegraph of the Burlington, and introduced the quadruplex system on that road. In 1888 Mr. Herr was appointed Superintendent of the St. Louis division of the Burlington, and after that Superintendent of the Galesburg division. He was called to Milwaukee in 1890 to take charge of the mechanical department of the Chicago division of the Chicago, Milwaukee & St. Paul, including the shops at West Milwaukee.

—Mr. E. B. Wakeman, who has recently been appointed General Superintendent of Transportation of the Great Northern, is a veteran in the railroad service. Mr. Wakeman entered the employ of the Illinois Central as night operator in 1863; after two years' service he was appointed train dispatcher and continued in that capacity for four years, when he accepted a similar position with the Chicago, Milwaukee & St. Paul at Prairie du Chien, remaining there until 1870, when he was appointed Assistant Superintendent of the company's lines west of the Missis-ippi River. The latter position was filled until 1876, when he was appointed Master of Transportation of the Iowa division and branches of the Chicago, Burlington & Quincy, where he remained until 1879, returning in that year to the Chicago, Milwaukee & St. Paul to assume charge of that company's car service. In April, 1879, he was ap-

pointed Superintendent of the St. Paul & Pacific, and continued in the same position when that property became the St. Paul, Minneapolis & Manitoba. In 1881 his title was changed to Superintendent of Transportation of all divisions of the same company, and again in 1883 to Assistant General Superintendent, occupying that position at the time of his last appointment.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—C. F. Resseguie has been appointed Superintendent of the Southern Division, with headquarters at Wichita, Kan., to succeed J. H. Parsons, resigned,

Binghamton & State Line.—The first board of directors are: Charles M. Dickinson, Joseph P. Noyes, Edward E. Kattell, Frederick E. Ross, Edmund O'Connor, Scott Brandt, Harry Ross, Walter P. Pratt and Ward Ives, all of Binghamton, N. Y.

Camden & Burlington County.—At the annual meeting last week the following directors were elected: John S. Irick, Richard C. Shreve, William H. Gatzmer, Joseph N. Du Barry, Richard Ashurst, Clifford S. Sims, John C. Sims, W. Budd Deacon, W. Hasell Wilson, William J. Sewell, Joseph H. Gaskill, C. E. Hendrickson, Henry D. Welsh, Theodore B. Gaskill, Frank Ellmaker.

Central of Georgia.—The following directors were elected at the meeting at Savannah, Ga., May 16, by the minority stockholders, under an order of the court restraining the Central Trust Co. from voting on the stock owned by the Richmond Terminal Co.: H. M. Comer, George J. Mills, Abram Vebburg, John K. Garnett, Joseph Hull, Henry R. Jackson, E. P. Howell, U. B. Harrold and H. D. Daniel. Messrs. Mills, Vebburg, Garnett, Hull, Jackson, Howell, Harrold and Phinisey were members of the board elected by the Richmond & Danville, and, with the exception of Messrs. Mills and Jackson, have been members of the Central directory for several years. The new men are Comer, of Savannah; Jacques, of Macon; Raoul and Fairchild, of New York, and McDanniel, of Monroe. The members of the old board who are left off are Gen. Alexander, J. C. Maben, James Swann, H. T. Inman and Gen. Sorrel.

Chesapeake & Ohio.—The jurisdiction of W. T. Smith, Master Mechanic of the Lexington Division, has been extended over the Big Sandy Division. His headquarters will be at Lexington, Ky. W. R. Morris has been appointed Foreman in charge of terminals at Ashland, Ky., and will report to the Master Mechanic of the Lexington and Big Sandy Division.

Chicago, Burlington & Quincy.—The annual meeting of the stockholders was held at Chicago May 18. There were 467,722 shares of stock represented, and they were voted for the re-election of the old Board of Directors, as follows: John M. Forbes, Charles J. Paine, John L. Gardner, Francis W. Hunnewell, William Endicott, Jr., and Richard Olney, of Boston; T. Jefferson Coolidge, Manchester, Mass.; Edward W. Hooper, Cambridge, Mass.; John N. A. Griswold, New York City; Peter Geddes, New York City; Charles F. Perkins, Burlington, Ia.

Cleveland, Canton & Southern.—The directors chose the following officers last week: President and General Manager, H. A. Blood; First Vice President, Secretary and Treasurer, W. O. Chapman; Second Vice-President, A. C. Barstow: Assistant Treasurer, E. D. Hewlus. President Blood has appointed the following officers: General Superintendent, J. W. Wardwell; Assistant Superintendent, H. A. Kennedy; General Freight Agent, H. R. Moore; General Passenger Agent, Fred R. Briggs; Master Mechanic, John Bean. The only change from the officers of the Cleveland & Canton is the appointment of F. R. Briggs to be General Passenger Agent to succeed Albert Rokuseh, who resigned some time ago.

Cleveland, Lorain & Wheeling.—The annual meeting of the company was held last week. The old directors were re-elected as follows: E. B. Thomas and A. S. Gorham, of New York, and John Newell, C. L. Cutter, Oscar Townsend, W. S. Streator and E. R. Perkins, of Cleveland. The directors re-elected the officers of last year.

Delaware & New England.—The annual meeting of the company which controls the Poughkeepsie Bridge and the Central New England & Western Railroad was held at Wilmington, Del., May 16. The old board of 13 directors was re elected, John W. Brock, of Philadelphia, being President, and Arthur E. Newbold of Philadelphia, Secretary and Treasurer.

Elk Mountain.—The following is a more complete list of the officers than was published last week: M. J. Keck, President; Orlando Metcalf, Vice-President; W. E. Renshaw, Secretary; W. F. Reed, Treasurer; O. Metcalf, Jr., Auditor, and Thomas H. Wigglesworth, General Manager and Chief Engineer. Board of Directors: Orlando Metcalf, W. E. Renshaw, M. J. Keck, H. T. Rogers, W. F. Reed, W. C. Price, Charles T. Murray and J. R. Wright.

Georgia Railroad & Banking Co.—The following directors were elected at the annual meeting at Augusta, May 11: President, Charles H. Phinizy; Directors, W. M. Reese, Joel A. Billups, H. D. McDaniel, H. H. Hickman, N. L. Hutchins, J. H. Alexander, D. N. Speer, A. W. Calhoun, T. W. Coskery, Leonard Phinizy, Wm. E. McCoy, James White, R. D. Spalding, Jacob Phinizy, George Dudley Thomas and W. A. Latimer. G. D. Thomas, of Athens, succeeds his father, the late Stevens Thomas, and W. A. Latimer, of Augusta, succeeds Judge Geo. Hillner, resigned.

Houston & Texas Central.—The appointment of Daniel Ripley as Traffic Manager and also the appointment of H. A. Jones as General Freight Agent has been announced.

Kingston & Utica.—The directors of this new company are: C. A. Plater, H. M. Bouton, E. White, W. X. Graham, A. M. Allen, G. H. Becker, J. A. Erkson, C. A. Layman, and C. H. Bush, of Prattsville, N. Y.

Little Falls & Dolgeville.—Charles R. Eastman, formerly connected with the Adirondack road, has been appointed Superintendent of this road, with headquarters probably at Little Falls, N. Y.

Louisville Southern.—At the annual meeting of the stockholders the following directors were elected: J. L. Smyser, V. D. Price, Bennett H. Young, Dennis Long, A. E. Richards, J. W. Stine, W. B. Hoke, W. F. Booker, E. E. Trahue, Julius Bamberger and Carey Peter, of Louisville, and T. B. Ripy, of Lawrenceburg, Ky.

Monterey & Mexican Gulf.—J. P. Flynn has been appointed Auditor. He has been Assistant General Superintendent of the road.

Morristown & Cumberland Gap.—At the recent election for officers of the company Brayton Ives, of New York City, was elected President, and H. E. Drew, of Morristown, Tenn., General Manager.

Mount Alto.—The following officers were elected at Carlisle, Pa., May 13: T. B. Kennedy, President; J. F. Boyd, Superintendent; Chauncey Ives, M. C. Kennedy, Hastings Gehr and Ezra Frick, Directors.

Mount Washington.—At the annual meeting of the stockholders at Concord, N. H. May 12, these directors were elected. Walter Aiken, John H. Pearson, Frederick Smyth, John W. Sanborn, Nathaniel White Jr. John P. George, George A. Fernald. The board organized with the following officers: President Walter Aiken; Clerk, Frank E. Brown; Treasurer, E. D. Harlow.

Missouri, Kansas & Texas.—At the annual meeting of the stockholders at Parsons, Kan., May 18, the following directors were elected: John D. Rockefeller, William Bond, William Dowd, Colgate Hoyt, H. W. Poor, Simon Stern, Joel F. Freeman, Samuel Sloan, H. C. Rouse, and Thomas C. Purdy, of New York; H. C. Cross, of Emporia, Kan.; B. P. McDonald, of Fort Scott, Kan.; J. Waldo, of St. Louis; Lee Clark, of Parsons; F. N. Finney, of Milwaukee, and H. J. Demarest Oyens, of Amsterdam. R. W. McGuire, of New York, has been appointed the successor of B. P. McDonald, local Treasurer, who has resigned.

New York & Harlem.—At the annual meeting in New York, May 17, the old board was re-elected with the exception that William H. Robertson was chosen in the place of ex-Judge Leonard. The board now consists of Cornelius Vanderbilt, W. K. Vanderbilt, Frederick W. Vanderbilt, Samuel F. Barger, C. M. Depew, Charles C. Clarke, John B. Dutcher, John E. Burrill, Francis P. Freeman, Samuel D. Babcock, Alfred Van Santvoord, Robert Schell and W. H. Robertson. There were 175,714 shares represented, the largest in the history of the company.

Northern Pacific—W. G. Pearce has been appointed Assistant General Manager, with headquarters at St. Paul, Minn. He will retain his present title and duties as General Purchasing Agent.

Northern Pacific Coast.—John W. Coleman has severed his connection with the company and William Steel, of the London & San Francisco Bank, has taken his place as President. William Graves, formerly of Los Angeles, has taken Mr. Coleman's place in the Board of Directors of the company, and has been elected Vice-President and General Manager. Mr. Coleman has sold the stock held by him.

Ohio River.—The annual meeting of the stockholders of the company was held at Parkersburg, W. Va., May 12, and the following board of directors was elected: E. W. Clark, Philadelphia; J. N. Camden, Parkersburg; C. M. Pratt, C. W. Harkness, H. H. Rogers and W. P. Thompson, New York: Geo. W. T. Thompson, B. D. Spilman, W. N. Chancellor and J. B. Neal, Parkersburg; James G. Fair, San Francisco; S. W. Colton, Jr., Philadelphia, and R. H. Browse, Grape Island, W. Va. George W. Thompson was re-elected President.

Pecos Valley.—The stockholders of the company held an annual meeting at Albuquerque, N. Mex., May 12, and elected the following directors for the ensuing year: B. G. Hagerman, Percy Hagerman, H. P. Lillibridge, of Colorado Springs; Col. L. H. Jackson, of Denver; Charles B. Eddy, of Eddy, N. Mex., and John A. Lee, of Albuquerque.

Pittsburgh, Fort Wayne & Chicago.—The annual meeting was held at Pittsburgh May 18, and the following directors whose terms had expired were re-elected: Charles Lanier, Henry Amy and William C. Egleston, of New York, and James McCrea, of Pittsburgh.

Port Royal & Augusta.—The annual meeting was held at Augusta, Ga., May 10. General Alexander tendered his resignation as President, which was accepted. All the former officers were re-elected except President Alexander and Director John C. Calhoun. H. M. Comer was chosen President; E. W. Workman, Secretary; B. C. Epperson, Superintendent. Directors: H. M. Comer, Savannah; W. L. Maulding, Greenville, S. C.; E. F. Voidery, J. H. Alexander, E. R. Schneider, J. B. Cumming, Augusta; W. L. Gray, J. A. Barksdale and J. J. Pluss, Laurens, S. C.; Jotin Ferguson, Greenville; T. J. Moore, Spartenburg; S. Blekley and W. W. Humphries, Anderson.

Quebec & Lake St. John.—At the annual meeting the following were elected directors: Frank Ross, E. Beaudet, Simon Peters, P. Garneau, Gaven Moir, Francois Langelier, M. P.; Thomas A. Peddington, Jules Tessier, M. L. A.; John Theodore Ross, and also Edwin Hanson, of Montreal, and Hon. George Irvine, representing the trustees of the bondholders, in addition to three non-elective members.

Quincy, Beardstown & Havana—The incorporators and first Board of Directors are Richard F. Newcomb, William Warfield, Frederick W. Meyer and Proctor Taylor, of Quincy, Ill., and David Holstead, of Keithsburg, Ill.

St. Louis Merchants' Bridge Terminal.—The annual meeting of the company was held last week and the following directors were elected: S. W. Cobb, A. B. Ewing, Charles D. McLure, John D. Liggett, C. C. Rainwinter, M. L. Rumsey, Charles Clark, D. R. Francis, D. W. Carruth, of St. Louis.

Sioux City, O'Neill & Western.—The annual meeting of the company was held at South Sioux City, Neb., last week. A. S. Garretson was elected President; Ellis L. Bierbower, Vice-President; D. S. Elliott, Secretary and Treasurer, and F. C. Hills, General Manager. The board of directors includes A. S. Garretson, F. C. Hills, F. A. Seaman, George W. Seevers and E. L. Bierbower, of Sioux City, Ia.

Southbridge, Sturbridge & Brookfield.—The following are the present officers of the company: President, James L. Fisk, of Cambridge, Mass.; Clerk, Arthur C. Moore, of Sturbridge, Mass.; Treasurer, Francis L. Chapin, of Southbridge; and Directors: James L. Fisk, of Cambridge; Calvin D. Paige, George W. Wells, and John M. Cochran, of Southbridge; Emory L. Bates, and Alvin B. Chamberlain, Sturbridge; Charles C. Sanderson, and Edwin A. Chase, of Deedham, and G. Henry Allen, of Brookfield. Chief Engineer, Arthur C. Moore, No. 100 Main street, Southbridge.

Thomasville, Silver Valley & Pee Dee.—At the annual meeting of the stockholders of the company, held at Thomasville, N. C., on May 5, the following officers were elected: John T. Cramer, President; J. H. Lambeth, Secretary and Treasurer: J. A. Leach, L. W. Elliott, V. Mauney, D. T. Lambeth, George Kinny, H. Clay Thomas and J. N. Badgett.

Union Railroad Terminal Co.—Directors for the company have been elected as follows: S. G. De Coursey, Franklin S. Buell, R. D. McCreary, E. G. T. Adams, Nicholas Thouron, E. T. Johnson, J. H. Poole, M. K. Lewis, Frank Rumsey, R. Bell, J. F. Reynolds, R. L. Manning and J. A. Fellows.

West Shore.—John Howard, General Foreman of the shops at Frankfort, has been appointed Master Mechanic of the Hudson River division, with headquarters at New Durham, N. J. He succeeds Thomas Aldcorn, resigned. Mr. Howard has been with the West Shore for several years, serving as Engine Dispatcher at Frankfort until Jan. 1, last year, when he was promoted to General Foreman.

Winchester & Beattyville.—The company has been permanently organized with C. W. Gourley, of Winchester, Ky., President, and Thomas Pryse, Secretary.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, Etc.

Baltimore & Cumberland.—The engineers who are making the new surveys east of Cumberland, Md., have reached a point near Hancock on the Cumberland River, about half the way to Hagerstown. A survey was made last fall between Cumberland and Hagerstown, and the company has now two parties of engineers in the field making additional surveys from Cumberland, east. These parties are in charge of Mr. James Parsons, who has been for several years the resident engineer of the West Virginia Central & Pittsburgh road. The survey now being made follows the rivers more closely than the previous line, as it is thought that a more advantageous route can thus be found. The route will be decided after the surveys are completed, but nothing definite has been done as to the construction of the road.

Bellingham Bay & Eastern.—Work is progressing very rapidly on this road, over which coal is to be hauled from Blue Cañon mine to Puget Sound, at New Whatcom, Wash. The bunkers are being built on Bellingham Bay, crossing the Great Northern track three-quarters of a mile south of Sehome, Wash. A. L. McCoy, of Fairhaven, are the contractors.

Binghamton & State Line.—This company was incorporated in New York last week with a capital of $130,000, to construct a standard gauge road, about 13 miles in length, from the city of Binghamton to a point in the southern part of the town of Binghamton, on the Pennsylvania state line.

Bristol, Elizabethton & North Carolina.—The construction company that is building the road is increasing its capital stock $150,000 to complete the line to Elizabethton, N. C. A. D. Reynolds, of Bristol, Tenn., can give information.

Buffalo, Rochester & Pittsburgh.—The line from Du Bois to Clearfield, Pa., on the Beech Creek road, will probably be ready for contractors before June 1. The line will be 27 miles long, through a country involving no special engineering difficulties. The road will be built by an independent corporation, with a guarantee of its bonds by one of the lines to the recent traffic agreement between this company, the Beech Creek and the Philadelphia & Reading, probably Buffalo, Rochester & Pittsburgh. Funds for building the road have already been secured on favorable terms. The line will be begun at once, and will be completed by fall.

Burlington, Cedar Rapids & Northern.—Bids were received last week for the construction of 40 miles of the extension from Forest City, Winnebago County, toward Estherville, Ia. Kimball & McNamara and A. P. Reynolds & Co. were among the bidders, and it is reported that the latter firm will secure the contract.

Keystone Northern.—A charter was granted in Pennsylvania this week to this company, whose line will run from a point of junction with the Pittsburgh & Western near Wurtemburg, Lawrence County, to Rose Point, same county. The capital is $150,000. F. L. Stephenson, of Allegheny City, is President.

Canadian Pacific.—Referring to the proposed extension southeast of Regina, in Assiniboia, for which surveys were begun early in the year, one of the officers writes that the engineers are still engaged on the preliminary surveys of the line from Regina to the international boundary. The final location will not be finished for a month yet, and it is impossible at present to say what portion, if any, of the work will be done this year.

Chesapeake & Ohio.—Arrangements have been made for the construction of a line up Gauley River to the mouth of Twenty Mile Creek, a distance of 7.3 miles. The contract for grading has been awarded to Rhinehart, Carpenter & Co., the work to be completed by Nov. 1. This branch leaves the main line at a point about one mile east of Gauley Station, in Fayette County, W. Va. There will be a short cantilever bridge over New River, with viaduct approaches on either side, the whole structure being about 600 ft. long. The grades are light and the curvature easy.

Chicago, Fort Madison & Des Moines.—Bids have been received for the construction of an extension from Libertyville to Ottumwa, Ia., 21 miles. Kimball & McNamara, of Sioux City, and E. P. Reynolds & Co., of Wymore, Neb., were among the bidders. The work will be let in a few days.

Chicago, Greenville & Southern.—Work will begin immediately on the line near Greenville, Ill. The line is to be built from a connection with the Jacksonville Southeastern, of which the new line is a branch, five miles north of Greenville, to Carlyle, Ill., about 25 miles.

Chicago Lake Street Elevated.—The Pencoyd Iron Works has been notified by Treasurer McDonald, of the Chicago Lake Street Elevated Railroad, to proceed with the erection of the railroad at Caicago. Over a mile of this road was built about two years ago by the Pencoyd Company. The manager of the iron works says that the new orders are by telegraph and very indefinite and they don't know whether they are to build the remaining 13 miles of the road or only one mile.

Chicago & Northwestern.—The second track construction, now under way on the Wisconsin and Galena divisions, is as follows: Des Plaines to Barrington, Ill., 16 miles; Lake Bluff to two miles north of Spring Bluff, Ill., 17 miles, and Racine to South Milwaukee, Wis., 14 miles. The contract for grading on the above has been let to J. A. Bohn, of Minneapolis. The work was begun April 1, and at this time there are about 500 men at work. J. B. Berry, Division Engineer, has charge of the work.

Concord & Montreal.—The contract for grading the Waumbek extension from the Whitefield & Jefferson branch was let last week to Ward & Douglas, of Barre, Vt. The length of the line will be about 3½ miles, and it will extend from near Jefferson Station, N. H., to Jefferson Hill. The work is to be completed by July 1 next.

Eureka & Red Bluff.—The surveying party reached Red Bluff, Cal., last week. Mr. Vincent, Chief Engineer, came to San Francisco to report to Marcus Pollasky, the promoter of the line, and the other members of the party returned over the mountains to Eureka. The survey is not yet completed, owing to the stormy weather.

Fairmont, Morgantown & Pittsburg.—The actual work of construction on this line was begun last week, six and a half miles from Morgantown, W. Va., on P. H. Bennett's contract which extends from that point to Point Marion, Pa. Other contractors along the line are getting their tools on the ground, and everything indicates that the road will be completed by October, the time stipulated in the contracts.

Gouverneur & Oswegatchie.—Moffett, Hodgkins & Clarke, of Syracuse, have been awarded a contract to build this line from Gouverneur east to Edwards, N. Y., 15 miles. The line is to be a branch of the New York Central & Hudson River road. Engineers have been surveying the line for the last few weeks.

Gurley & Paint Rock Valley.—W. T. Bennett, J. C. Jenkins, J. N. Harris, and a Mr. Jones, have sub contracts under Allen Mosely & Co., on the section from Gurley, Ala., up Paint Rock River.

Illinois Central.—We have already referred to the surveys for a line between Parsons and Grenada, Miss., to connect the Yazoo branch with the main line. The engineer in charge of the party writes that nothing has been done toward constructing the road except to run the preliminary survey to estimate the cost.

Jacksonville, St. Augustine & Halifax River.—A survey was begun last week for a line from Dayton south along the east coast of Florida to New Smyrna, Fla., about 10 miles.

Kanawha & Michigan.—Captain J. L. Williams, chief engineer of the extension, is authority for the statement that the contract for building the road from Malden, Kanawha County, W. Va., to the Gauley River, was let on last Saturday to J. S. Casement, of Painesville, O. Under the contract the road is to be completed by Nov. 1, at which time the Chesapeake & Ohio proposes to have a bridge built across the Gauley River to connect with a branch of the Chesapeak & Ohio, which has been surveyed up that stream. The Chesapeake & Ohio will also bridge New River, thus giving the Kanawha & Michigan a direct connection with the main line of the Chesapeake & Ohio. Work on the extension will be commenced within the next 10 days, and will be pushed with all possible rapidity.

Kickapoo Valley & Northern.—The United States Construction Co., which built this road last year between Wauzeka and Soldiers' Grove, Wis., is arranging to begin work in a few weeks on an extension north to Wilton, Wis., about 15 miles.

Kingston & Utica.—The railroad was incorporated in Albany, N. Y., this week, with a capital of $40,000, to construct a road from Prattsville, Greene Co., to Gilboa, Schoharie County.

Lehigh Valley.—A large force of men is at work grading and tracklaying on the new extension from Perth Amboy, N. J., to a connection with the New York & Long Branch road, which will be reached by lowering the grade of the new line. This will give the road the long desired opportunity of running trains from western New York and Pennsylvania to the New Jersey coast resorts without change.

Lick Run.—Messrs. Booth & Giles are building a coal road four miles long from their mines now being operated at Simpson, W. Va., to the Baltimore & Ohio Railroad, near Grafton.

Louisville & Nashville.—Many improvements are being made in the roadway of the South & North Division this year. Thirty-five miles of new 70-lb. rails are being laid between Decatur and Montgomery, Ala., replacing the 58-lb. rail with which the track was originally laid. A portion of the track was relaid with the new rail last year. The trestles are being filled and others strengthened.

Massillon.—This branch of the Cleveland & Canton will be completed in July. The branch extends from Navarre, on the main line, about six miles into a new coal district, known as the Massillon, with four miles of branches, and is being built by persons connected with the company. This field is about 12 miles south of Canton, and is estimated to include 8,000,000 tons of bituminous coal. The road will be operated under lease.

Mexican Roads.—An important concession for a new standard gauge line has been granted, to run from the city of Mexico to the Pacific port of Zihuatanejo, south of Manzanilla. The subsidy is at the rate of $8,000 per kilometre, but is not payable until five years after the line is built. The concessionnaires are General Camano, Señors S. E. Halberstadt, Rudolph Weiser, Pedro Alcocer and Juan Zaleiva.

Mexico, Cuernavaca & Pacific.—The grading has been finished to Cuernavaca, Mex., from the terminus of the road, in the City of Mexico.

Middle Georgia & Atlantic.—The local papers in Georgia have had a good deal to say recently of the prospects for resuming grading on the branch from Covington, northeast to Machen, Ga., a distance of 37 miles, but the Chief Engineer writes that the matter is still unsettled, and it is probable that nothing definite will be done for some time.

Nashville, Chattanooga & St. Louis.—The Tennessee & Coosa, between Guntersville and Gadsden, Ala., will be completed and in operation by July 1. The principal work to be done is to complete the track on the last few miles to the Tennessee River and Guntersville, Ala.

New Roads.—The Laporte syndicate, which is improving Morgan's Point, on Trinity Bay, between Houston and Galveston, has signed a contract for building a road from Laporte to Harrisburg, connecting with the Southern Pacific, and work will begin at once. It will be about eight miles long, standard gauge, and will connect with deep water.

New York Bay Extension.—The contractors for this branch of the Long Island, Hawman Bros., of Reading, Pa., have graded about five miles of the line between Hempstead Crossing and Valley Stream, N. Y. At present only 50 men are at work. The work is light, with grades of 25 ft. to the mile and maximum curves of three degrees. There is one 16-ft. stone arch bridge on the line. The preliminary surveys have been made from Valley Stream east to New Lots, near the Brooklyn city line, but this section is not yet under contract.

New York Central & Hudson River.—The company has agreed to remove its tracks now on Eleventh avenue, in New York City, between Thirtieth and Sixtieth streets, to Twelfth avenue, as soon as the latter avenue is opened and when the necessary legal authority can be obtained. What authority is needed does not clearly appear. Eleventh avenue is about 700 ft. from the Hudson River, and Twelfth avenue lies along the shore of the Hudson River. The tracks in Eleventh avenue constitute the old main line of the road, and are used chiefly by freight trains, a few local passenger trains being run to and from the station at Thirtieth street. All trains run very slowly, and they are guarded by flagmen; but men or boys are frequently injured, and the residents complain loudly at the presence of the railroad in the street.

Norfolk, Wilmington & Charleston.—The town of Wilmington, N. C., will probably hold an election to decide as to a subscription of $50,000 to the capital stock of the railroad. Chocowinity Township will also vote on a proposition to subscribe $15,000 to the same company.

Oxford Coast Line.—The Commissioners of Oxford, N. C., have adopted resolutions declining to issue the $40,000 of bonds voted to aid in the construction of this road, which was to connect the town with the counties of eastern North Carolina; and to connect with the Atlantic Coast Line. The road was to be only 4½ miles long.

Pawnee.—Work on the extension of the road west to Auburn, Ill., eight miles, is progressing rapidly, and it is expected to have the line completed within a week. The company has arranged with the Chicago and Alton to run trains over the Alton track from Auburn to Springfield.

Pennsylvania.—The company is credited with proposing to build still another suburban line in the country north and west of Philadelphia. The surveys are reported to have been made from a point on the Fort Washington branch, near Ivy Hill Cemetery, in a southeasterly direction to Pittsville. The objective point is not known, but it is supposed that it may be intended to continue the line to a connection with New York Division at North Penn Junction.

The surveys for the Wistar cut-off from Glen Side to Wistar Station, on the Germantown & Chestnut Hill branch, have been completed. The line will be about six miles in length, and will reduce the railroad distance to Twelfth and Market streets, Philadelphia, for all points above Jenkintown, nearly two miles, besides avoiding the heavy Oak Lane grade.

Potomac Valley.—Work on the bridge across the Potomac River at Cherry Run, W. Va., is being pushed along rapidly. The bridge is 700 ft. in length, divided into five spans of 140 ft. each, four of which spans are now finished. With favorable weather for 20 days the bridge can be completed, and will be ready for the rails and ties. A severe wind storm which passed over that section about a week ago blew down 50 or 60 bents of a long trestle which the company was building, killing one man and injuring several others. The part of the trestle which was blown down was 25 ft. high and nearly completed.

Quincy, Beardstown & Havana.—Articles of incorporation of the company were filed in Illinois last week. The company proposes to construct a road from Quincy through the counties of Adams, Brown, Schuyler and McDonough, to the Illinois River, at a point opposite Havana, or Beardstown. The capital stock is $2,500,000, and the incorporators are Richard P. Newcomb, William S. Warfield, Jonathan Parkhurst and others.

Rockaway Valley.—Superintendent Melick has now only 60 men at work on the extension between Mendham and Morristown, N. J.

Santa Fe, Prescott & Phœnix.—Four parties of engineers are now in the field pushing the location South of Ash Fork, Ariz., on the Atlantic & Pacific, and so far about 25 miles of the line has been located. The contractors are B. Lantry & Sons, of Strong City, Kan., and they have about 600 men now at work. The grading has been finished for 10 miles from Ash Fork, and nine miles additional is cleared. The maximum grade is about 1½ per cent., except for a short distance on the mountain division, where it will be two per cent., compensated for curvature. The length of the line between Ash Fork and Phœnix is about 200 miles, but so far little work has been done beyond Prescott. The route south of that town will be through Congress, Wickenburg and Peoria to Phœnix. G. W. Vaughn of Prescott, Ariz., is the Chief Engineer.

Seattle, Sidney & Gray's Harbor.—Articles incorporating the company were filed at Seattle, Wash., last week. The incorporators are: Charles A. Mularky and J. W. Hayes, of Portland, Or.; C. P. Stone, D. B. Ward, Charles Armstrong, Twymann C. Abbott and William T. Chalk.

Snow Fork & Hocking.—This company has been organized with David Lee, of Zanesville, O., President, and S. P. Peabody, of Columbus, Secretary. The line will be built from New Straitsville to Athona, and will be a coal branch for the Baltimore & Ohio.

Southbridge, Sturbridge & Brookfield.—A new location is now being made between Brookfield on the Boston & Albany and Southbridge, on the New York & New England, a distance of about 13 miles. The preliminary surveys were made last year, and as already recorded, part of the right of way has been secured. The curves and grades will be light, and there is no very difficult work on the line. There will be three iron bridges about 100 ft. long, and one 80 ft. long, and there will also be two trestles 400 ft. and 300 ft. long respectively. The capital stock amounting to $100,000 has been all subscribed, and bonds will be issued to complete the road A. C. Moore, of Sturbridge, Mass., is the Chief Engineer.

Southern Pacific.—President Huntington returned to New York last week after a long trip to the Pacific Coast. He said that the improvements and extension of the system now being made will necessitate an expenditure of between $4,000,000 and $5,000,000, and will not be completed for two years. The most important work is the construction of the coast line between Santa Margarita and Santa Barbara, Cal., 110 miles. This new line will traverse a new and thriving country, and besides giving the Southern Pacific two lines to Los Angeles it will develop an important coast trade. Mr. Huntington thinks that it will take at least two years to complete this road. There is a large amount of tunneling to be done. The most important work on the main line is the straightening and leveling of the road for about 40 miles near Pecos, where 12 miles will be saved in actual distance; also the changing of about 20 miles of the line at Dragoon Summit, to get it out of a sag, and the removal of the railroad structure from the bed of the Gila River, just east of Yuma, to high land. About 32 miles of the road at this point has been in periodical danger of being overflowed or washed away. The company is also building several short roads in the San Joaquin Valley in California.

Tacoma Eastern.—For a week 15 surveyors have been working in the vicinity of Puyallup, Wash., and since January they have made a preliminary survey from Tacoma, nearly as far as Mineral Creek, on the Nesqually River. It will cost $1,000,000 to build the road from Tacoma to Mineral Creek.

Texas Central.—The question of the extension from Albany to Anson, in Jones County, Tex., about 30 miles, is said to be now under consideration. General Manager Hamilton has recently returned from a trip over the line of the proposed extension, and will probably make a favorable report of it to the directors.

Velasco & Northern.—The company which is to build the line is still getting donations and settling up right of way matters. The surveyors are running a line from Rosenberg Junction toward Hempstead, Tex., and it is claimed that the grading of the road will commence at an early day near Velasco, Tex.

Velasco Terminal.—Tracklaying is progressing on the road from Velasco, Tex., to Surf Side, and will be finished in a short while. It is the company's intention next year to run electric cars on this line, but this year a steam engine will be used.

Victoria & Sidney.—The Common Council of Victoria, B. C., has been asked to pass a law to guarantee three per cent. interest on the bonds of this road to the extent of $300,000 and grant the company exemption from taxation for a number of years.

Wilkes Barre & Eastern.—President W. P. Ryman writes that the locating work is so far advanced that he hopes to be ready to receive bids for building the road by June 15. The total length of the line will be about 60 miles, and the route will be from Wilkes Barre to Stroudsburg, Pa. Part of the work will include heavy rock cutting, and there will also be considerable masonry and bridge work. About 300 men are working at present on the Wilkes Barre end, and eight miles of the road has been graded.

Williams Valley.—The road from West Brookside, the terminus of the Pine Grove branch of the Philadelphia & Reading, to Williamstown, Dauphin County, Pa., the terminus of the Summit Branch of the Pennsylvania Railroad, and which has been in course of construction for the past year, was opened for passenger traffic May 16. The new road is seven miles in length.

Wyandotte & Detroit River.—A charter for this company was filed in Michigan last week. The capital stock is $250,000. The proposed road is to extend from Toledo, O., to Detroit. This is probably the line projected by W. R. Burt, of Saginaw, Mich., which has been partly surveyed.

GENERAL RAILROAD NEWS.

Boston & Maine.—The report of earnings and expenses for the three months to March 31 is as follows:

	1892.	1891.	Inc.
Gross earnings	$3,365,417	$3,185,527	$179,890
Oper. expenses	2,302,078	2,292,179	9,899
Net earn	$1,063,339	$893,348	$169,991
Other income	159,605	117,959	11,646
Total net	$1,222,944	$1,011,307	$181,637
Fixed charges	971,541	971,049	492
Balance	$251,403	$70,258	$181,145

Caldwell.—This line, running from Caldwell, N. J., to Great Notch, on the line of the New York & Greenwood Lake Railroad, has been bought for that company. The purchase was made at sheriff's sale, and the price paid was $4,100. The road cost $85,000, and most of the stock in it was held by small farmers along the line. These did not wish to sell out, but the larger stockholders long ago turned over their shares to the Greenwood Lake road.

Canadian Pacific.—Advance copies of the annual report for 1891 show the following figures:

	1891.	1890.	Increase.
Gross earn	$20,241,095	$16,552,528	$3,688,567
Oper. expen	12,231,436	10,252,828	1,978,608
Net earn	$8,009,659	$6,299,700	$1,709,959
Fixed charges	4,664,493	4,246,618	417 875
Surplus	$3,345,166	$2,053,082	$1,292,084
Dividend	1,300,000	1,300,000	.....
Surplus	$2,045,166	$753,082	$1,292,084
Total surplus	4,701,599	2,656,432	2,045,166

Rates per ton per mile were .91 cent against .84 cent in 0890, and passenger rates per mile were 1.7 cents against 1.74 cents. China and Japan steamers more than paid interest on their cost, although the full service did not begin until after midsummer. Land sales were $294,875, an average of $4.05¾ per acre. The company has 15,444,200 acres of land unsold, and the Manitoba Southwestern 1,267,308 acres.

Charleston, Cincinnati & Chicago in Tennessee.—Samuel Hunt, of Cincinnati, has bought for $200,000 in the interest of the Reorganization Committee that portion of the road built in East Tennessee. The sale was made by order of the Court of Chancery to satisfy claims of McDonald, Shea & Co., and W. Kenefick, contractors, amounting to $581,000. The portion of the road in North Carolina, South Carolina and Tennessee is still in the Receiver's hands.

Cleveland, Canton & Southern.—The long proposed consolidation of the Cleveland & Canton and its branches under this name was finally effected last week. The roads merged are the Cleveland & Canton, the Waynesburg & Canton, the Cleveland, Canton & Southern, and the Cleveland, Chagrin Falls & Northern. The preferred and common stocks of the Cleveland & Canton become the stock of the new consolidated company share for share without exchange. It is proposed to issue a new first consolidated 50-year five per cent. mortgage at the

rate of $26,000 a mile, and holders of the securities of the old companies will have the privilege of exchanging. The company owns 206 miles of track, with terminal property at Cleveland, Canton and Zanesville, O.

Columbus, Hocking Valley & Toledo.—The directors have declared a dividend of 2½ per cent. on the preferred stock out of the earnings of the first six months of the year. The preferred stock was created in November last for the purpose of retiring seven per cent. second mortgage bonds. No financial statement was submitted.

Evansville & Terre Haute.—Harvey Fisk & Sons, of New York, offer to investors a portion of the recent issue of $1,000,000 first general mortgage debentures of five per cent. gold bonds of the company. The total amount authorized is $7,000,000, of which $3,855,000 are held in trust to redeem all prior liens as they mature. The remainder are reserved for the improvement and extension of the property, especially for additional terminals, double track, equipment and coal branches. Only $1,000,000 will be issued for these purposes at present.

Georgia Railroad & Banking Co.—The following is the report of the railroad for the nine months ending March 31, 1892: Earnings from passengers, $375,493; earnings from freights, mail and express, $900,311; gross earnings, $1,275,804; operating expenses, $991,809; and net earnings, $283,995.

Illinois Central.—The income from traffic, for the nine months ending March 31, is as follows:

	1892.	1891.	Increase.
Miles operated	2,884.	2,875.	9.
Gross earnings	$14,517,274	$13,670,084	$1,147,193
Oper. expense & taxes	10,503,543	9,423,752	1,079,791
Net earnings	$4,313,731	$4,246,332	$67,399

The gross receipts from traffic for the month of April, 1892, are estimated at $1,402,190; for April, 1891, the receipts were $1,376,572, the estimated increase being $25,618.

Lebanon Springs.—The road was sold, May 16, to Charles E. Foster, of New York, for $55,000. The sale was the result of a judgment obtained by Aaron R. Stevens, of New York, against the Union Trust Co., of New York, the Lebanon Springs road and others.

Macon & Atlantic.—The Receivers' sale of the road and of the property of the Macon & Savannah Construction Co., which was to take place at Macon, Ga., last week, was not effected, as no one made a bid for the property. The order authorizing the sale specified that the road should not be sold for less than $500,000.

Manhattan (Elevated).—The company is making extensive improvements in the yard at 129th street and Second and Third avenues, New York City. At the north side of the Suburban Company's tracks near the Second avenue terminal a large power house will be erected, the foundation of which has been begun. In this house will be placed three large marine boilers for furnishing power to run an elevator and an engine for an electric light plant (Edison system), which will furnish light for the Second and Third avenue terminals and the Suburban terminal. When the power house is finished all the locomotives on both lines will take their coal directly from it. The structure will have a storage capacity of 5,000 tons. Coal will be brought to it in boats on the Harlem River, and raised to a level with the tracks by the elevator. The coaling stations at Ninety eighth street and Third avenue and Sixty-seventh street and Second avenue will then be abandoned. Some of the Second avenue trains are soon to be run across the bridge and through over the Suburban company's line. The old interlocking tower that stood at the end of the station at 129th street has been removed to the north side of the Suburban yard to make way for the improvement. An additional track has been built on the west side of the station for south bound trains. One of the tracks in the Suburban yard has been taken out, so that Suburban and New York, New Haven & Hartford trains can now come in on any one of three tracks. A new platform has deen erected for Suburban trains to stop at and a partition is being built through its centre to divide passengers going from the Second, Third and Suburban trains; A waiting-room is also being built at the east end of the platform. To the south of the platform part of a storage yard has been constructed for Second and Third Avenue trains. It will be continued to third Avenue when its use becomes necessary.

New York & Greenwood Lake.—A mortgage has been filed to secure the payment of $500,000 of five per cent. bonds of the New York & Greenwood Lake Railroad Co. The bonds are due 50 years from May 2, 1892, and are issued to pay for the purchase of the Caldwell road.

New York & New England.—The following is a report of the earnings for the quarter ending March 31:

	1892.	1891.	Inc. or Dec
Gross earnings	$1,360,888	$1,345,769	I. $15,119
Oper. expen	1,173,811	961,881	I. 211,930
Net earnings	$187,077	$383,888	D. $196,811
Other income	1,515	1,546	D. 32
Total	$188,592	$385,435	D. $196,843
Fixed charges	460,676	443,849	I. 16,827
Deficit	$272,084	$58,414	I. $213,670
Perferred dividend	57,750	47,250	I. 10,500
Deficit	$329,834	$105,664	I. $224,170
Cash on hand	128,734	49,827	I. 78,907

The company reports gross earnings for March of $47,537, a decrease of $6,413 as compared with the same month of last year.

Pine Bluff, Monroe & New Orleans.—The Pine Bluff & Swan Lake Division, a short Arkansas line, which has been in litigation in the United States Court at Little Rock, has been turned over to the plaintiff, F. M. Gillett, of New York, President of the Stuttgart & Arkansas road, now in operation between Stuttgart and De Witt, 25 miles.

Poughkeepsie Bridge Co.—On the petition of the Metropolitan Trust Co., of New York, and of counsel for the Reorganization Committee, a decree has been issued for the sale of this company's property at foreclosure at Poughkeepsie, N. Y., May 30. The time for depositing bonds of the Poughkeepsie Bridge Co. and the Central New England & Western Railroad under the reorganization plan expired last week. Of the Central New England & Western issue of $2,500,000, all but $25,000 have been deposited. This property will probably not be foreclosed. About $200,000 of the $5,000,000 Poughkeepsie Bridge bonds are still outstanding. Foreclosure proceedings in the bridge case will be pushed, and it is expected they will be carried through within the 90 days contemplated by the plan. The reorganized system will be known probably as the Philadelphia, Reading & New England Railroad.

Rhode Island & Massachusetts.—J. P. Ray, of Franklin, Mass., President of the company, has sold 2,000 of the 2,800 shares of the capital stock to J. Pierpont Morgan and W. Rockefeller, the latter a director of the New York, New Haven & Hartford. The purchase is said to be in the interest of that road, and this seems very probable. The road is 13 miles long, from Franklin, Mass., to Valley Falls, R. I., near Providence, and is leased to the New York & New England. That road has run its Boston and Providence trains over the line, but it was announced this week that the New York & New England would discontinue its express trains between Boston and Providence.

Richmond & West Point Terminal.—The Olcott Reorganization Committee has declared the proposed plan for the reorganization of the system inoperative, and announced on May 16 that holders of underlying securities had failed to deposit an amount sufficient to constitute a basis for the proposed issue of bonds and to enable the committee to declare the plan effective. Stockholders controlling about 250,000 shares of Terminal common stock and a large amount of other securities met on the same day and appointed Samuel Thomas, W. P. Clyde and W. E. Strong a committee to represent their interests. It is believed that this committee will propose a new plan. General Thomas says that the East Tennessee, Virginia & Georgia will not be included in the new reorganization plan. That system did not need reorganization, but the Richmond Terminal and the Richmond & Danville required reorganization. General Thomas thought that a 5 or 6 per cent. assessment on those stocks would be needed.

San Antonio & Aransas Pass.—Judge King of the Texas District Court of San Antonio, last week issued an order for the foreclosure of the mortgage bonds of the company, the date of sale to be Nov. 8. Before this was done the two independent suits of the Farmers' Loan & Trust Co, were consolidated with the suit of Johnson & Hauzen, the contractors, which action was the one brought for the receivership.

Tennessee Midland.—The new owners propose to issue two series of bonds to retire the present issues. First mortgage five per cent. bonds, at the rate of $11,000 a mile, will be issued as stated last week, and second mortgage five per cent. bonds, at the rate of $9,000 a mile, will also be issued.

Union Pacific.—The earnings of the entire system for March are as follows:

Month of March:	1892.	1891.	Inc.
Gross earn	$3,298,161	$3,272,986	$25,175
Oper. exp	2,262,912	2,257,171	5,741
Net earn	$1,035,249	$1,015,815	$19,434
Jan. 1 to March 31:			
Gross earn	$9,438,704	$9,167,386	$271,318
Oper. exp	6,577,244	6,464,554	112,690
Net earn	$2,861,460	$2,702,832	$158,628

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, May 18, 1892.

The passenger representatives of the Burlington system met last week and perfected arrangements for the abolishment of unlimited tickets and stop-over privileges on that line July 1.

The parties who are behind the movement to oust the ticket brokers before the World's Fair begins are reported as not disposed to give up the fight, but as collecting new evidence which they will lay before the next Grand Jury in the hope that it will be sufficient to secure an indictment. It is certain that the Illinois law is adequate if the necessary evidence is forthcoming.

The Central Traffic Association lines have met the rate of 61 cents made by the St. Louis lines on sacked wool to New York by authorizing a rate of 53 cents from Chicago to New York and 59 cents to Boston, with the usual differentials to other Eastern points.

The freight committee of the Central Traffic Association have adopted resolutions that the sixth class rates should be advanced to the old basis of 25 cents per 100 lbs., Chicago to New York, on May 30, on all articles except grain and its products. The resolution also requested the vice-chairman of the joint committee to procure an agreement if practicable, and simultaneously announced fixing the lake and rail differential on sixth class by percentage on all articles except grain, but not to exceed five cents per 100 lbs., and urging the Trunk Lines to take concurrent action.

Traffic Manager Jaycox, of the Columbian Exposition, is finding that his path is by no means carpeted with roses. If current reports are to be believed the management would not be averse to taking his scalp if a suitable opportunity should present itself.

The Federal Grand Jury has indicted A. Fell, Western Freight Manager of the Delaware, Lackawanna & Western, for violating the Interstate Commerce Law by giving rates to Swift & Co. which discriminated in their favor as against other shippers. It is said that the evidence is all documentary, and that the payment of large commissions to Swift & Co.'s clerk "for securing freight" was the method adopted for favoring this firm.

The meeting of the Western Passenger Association to elect a Chairman has not been held yet, the reason given being the absence of interested members. It has been arranged to place the affairs of the association in the hands of the Secretary until Mr. Finley's successor is chosen. Probably no election will take place until after the meeting of the Southwestern Railway & Steamship Association here next week.

The Columbian Passenger Committee have agreed upon the following round trip rates to the dedicatory ceremonies of the World's Fair, Oct. 11 to 13: From points more than 150 and not over 350 miles from Chicago, one and one-third the regular one-way first class fare; from points within 150 miles of Chicago the same; from points outside the 350 mile radius, fare one way. These latter tickets to be good for return until Oct. 17; the others until Oct. 15.

The Ohio River Association lines have agreed to restore passenger rates May 23.

The Western Freight Association transacted considerable business of a routine nature last week, and adjourned without taking action on the proposed amendments to the rules which were proposed by the Burlington. The subject was postponed until the next meeting.

Traffic Notes.

The New York, Lake Erie & Western has made a material reduction in the rates on lumber from northwestern Pennsylvania to Eastern points.

The Pennsylvania Railroad which, in consequence of the competition of electric street car lines, recently reduced fares about 50 per cent. between Pittsburgh and Wilkinsburg has more than doubled the traffic thereby, the ticket sales at some stations showing an increase of 300 per cent.

A press dispatch states that, there having been sharp competition between the Interoceanic and the Mexican (English) railway companies, the Mexican Railway Co. has within the last few weeks offered to form a pool with the Interoceanic; but that the latter, having the greater part of the freight traffic between the City of Mexico, Jalapa, Puebla and Vera Cruz in its hands, refused to consider the offer.

The Trunk line Executive Committee has voted to restore east bound sixth class freight rates to the basis of 25 cents per 100 lbs., Chicago to New York, with the exception of grain and its products. This action agrees with that taken at Chicago, but at last accounts the St. Louis roads refused to make any sixth class rates higher than those on grain until more fully guaranteed that lake and rail rates from Chicago eastward would be maintained.

The agreement for the restoration of passenger fares between Chicago and Cincinnati, which was referred to last week, has a clause providing for the payment of a commission of one dollar a ticket between Chicago and Cincinnati and Chicago and Louisville. It is said that this clause was introduced by the Pennsylvania, causing much surprise among the representatives of the other roads. The Cleveland, Cincinnati, Chicago & St. Louis has put on a solid train between St. Louis and Cincinnati.

An action has been filed in the United States Court at Denver by the American Smelting Co. against the Denver & Rio Grande, the Burlington & Missouri River and the Chicago, Burlington & Quincy roads to recover damages for refusing to transport bullion as freight at a fair rate from Leadville, Col., and alleging that the plaintiffs were forced to pay an unreasonable rate of $16 per ton, the just rate being $8.50. During January, 1891, 6,000 tons were transported at the alleged unfair rate. For this and other alleged discriminations, the plaintiffs asked for $50,000 damages.

The percentages of tonnage and revenue on all traffic subject to the Southwestern Missouri River agreement for the month of February are as follows:

Line.	Tonnage, per cent.	Revenue, per cent.
Atchison	14.7	18.
Alton	12.6	13.4
Burlington	20.8	19.2
St. Paul	5.3	7.
Rock Island	10.8	11.5
C., St. P. & K. C	4.4	5.
Wabash	7.9	8.3
Mo. Pacific	23.5	17.6
	100.0	100.0

Traffic Manager Leeds, of the California Traffic Association, whose attempts to secure action by the Railroad Commissioners of that state, on his demand for a general reduction of freight rates, have been reported in these columns, has made a long report to the directors of his association outlining a policy which he desires to see adopted. Among other things he says:

"I would recommend that every effort of this Association be put forth to wipe out every vestige of railroad legislation from the constitution and the statute books which has any bearing upon rates and fares. This, of course, can only be accomplished by making this a question of politics and by the election of a legislature pledged to carry out such a policy. Besides this, an effort should be made to remove the present Board of Commissioners from office with as little delay as possible. . . . If it becomes necessary to make a political fight, our support individually and collectively should be thrown to those who are pledged to our fight regardless of political party or any other consideration."

This has led to the resignation of J. B. Stetson, President of the Association, who says that his position as a Republican will not permit him to countenance Mr. Leed's views, as the Democratic party may adopt them for its political platform.

Supreme Court Sustains Judge Jackson's Party-Rate Decision.

The United States Supreme Court on May 16 decided the case commonly known as the Baltimore & Ohio theatrical rate case, involving the right to sell at a reduced rate tickets to parties of 10 or more persons traveling together. The court in an opinion by Justice Brown sustained the decision of Judge Jackson refusing to issue an injunction to restrain the road from continuing the sale of party-rate tickets. The general ground of the opinion is that it is not unjust discrimination to sell tickets at wholesale cheaper than at retail.

The case originated in a complaint made by the Pittsburgh, Cincinnati & St. Louis against the Baltimore & Ohio to the Interstate Commerce Commission. The charge against the Baltimore & Ohio was that it had violated the interstate commerce act, first, by failure to post in its offices excursion rates, the Baltimore & Ohio Railroad Company insisting that the advertisement in the newspapers was all that was required, and, second, by the sale of party rate tickets at reduced rates.

The second allegation, which is the one of substantial importance, the Commission decided against the Baltimore & Ohio, and when it continued, in disregard of the Commission's order, to sell party rate tickets, applied to the United States Court for the Southern District of Ohio for an injunction. When Judge Jackson decided against the Commission it carried the case to the United States Supreme Court.

The court in its opinion says: "The railroad companies are bound only to give the same terms to all persons alike under the same conditions and circumstances, and any fact which produces an inequality of conditions justifies an inequality of charges."

In the argument before the Supreme Court a great deal was made of the point that these party-rate tickets were commutation tickets, and, as such, lawful under the Interstate Commerce Act. But the court, in its opinion, while referring to this contention, did not absolutely rule upon it, basing its opinion on a consideration of the clause of the act forbidding unjust discriminations and the grant of undue or unreasonable preferences to any person or persons, and applying to this particular case the construction it gave those words.

Eastbound Freight Shipments.

The shipments of eastbound freight from Chicago by all the roads for the week ending May 14 amounted to 50,619 tons, against 55,968 tons during the preceding week, a decrease of 5,349 tons, and against 49,611 tons during the corresponding week last year, an increase of 1,008 tons.

GEO. WESTINGHOUSE, JR., President. T. W. WELSH, Supt. JOHN CALDWELL, Treasurer. W. W. CARD, Secretary. H. H. WESTINGHOUSE, General Manager.

THE WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 325,000 cars. This includes (with plain brakes) 252,000 freight cars, which is about 23 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording the opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 173,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception

Year.	No. per year.	Grand total.
1881	105	105
1882	1,085	1,190
1883	4,966	6,156
1884	15,051	21,207
1885	10,410	31,617
1886	8,946	40,563
1887	9,281	49,844
1888	27,696	77,540
1889	26,065	103,605
1890	50,502	154,107
1891	39,061	193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

E. L. ADREON, Manager. JOHN B. GRAY, Agent. C. C. HIGHAM, General Supt.

THE

AMERICAN BRAKE COMPANY.

NEW YORK OFFICE, 160 Broadway, JOHN B. GRAY, Agent.

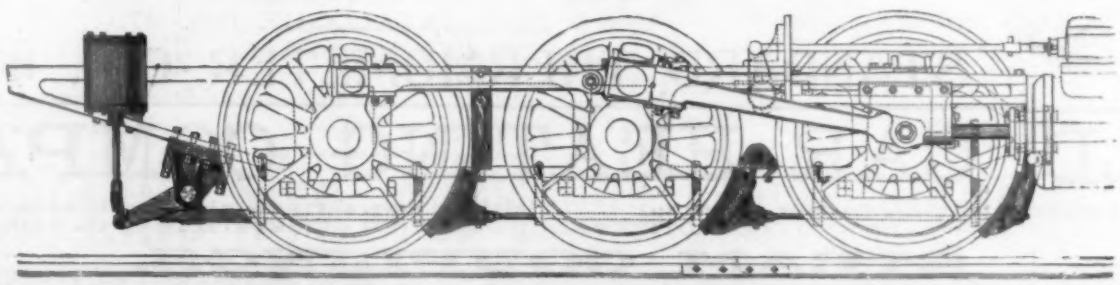
THE WESTINGHOUSE AIR BRAKE CO., Lessee,

MANUFACTURERS OF

CHICAGO OFFICE, GRAND PACIFIC HOTEL.

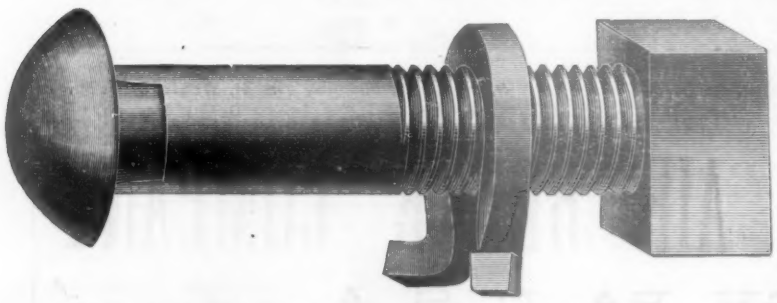
LOCOMOTIVE BRAKES.

General Offices and Shops, Second and Tyler Sts., ST. LOUIS, MO., U. S. A.



Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers, furnished to operate with either STEAM, AIR or VACUUM.

THE "STANDARD" NUT LOCK



Manufactured under D. O. Ward's Patents by the

STANDARD NUT LOCK CO.,

NOS. 236-248 BANK ST., NEWARK, N. J.

SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously: rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down *thread of bolt*.

The nut lock for ¾ bolt made of ¼ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, *i. e.*, the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in *inwardly curved* extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

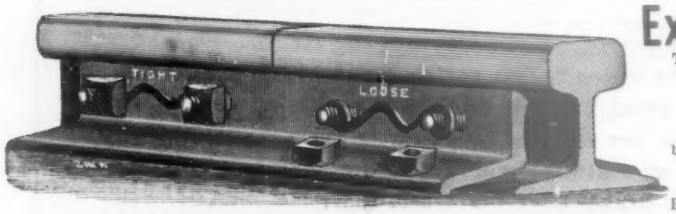
Unlike any permanently placed, double washer, the Standard *is* interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their *dead* "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.



Excelsior Automatic Nut-Lock and Fish Plate Spring

These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn., Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

RUFFNER & DUNN,

Patentees and Sole Mfrs., SCHUYLKILL FALLS, Philadelphia, Pa.

Simple.

Easily Applied.

Very Effective.

THE NATIONAL LOCK WASHER

THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

Sixty Millions in Use in Railroad Track

For Use on All Kinds and Classes of Work.

Made for all sizes of bolts.

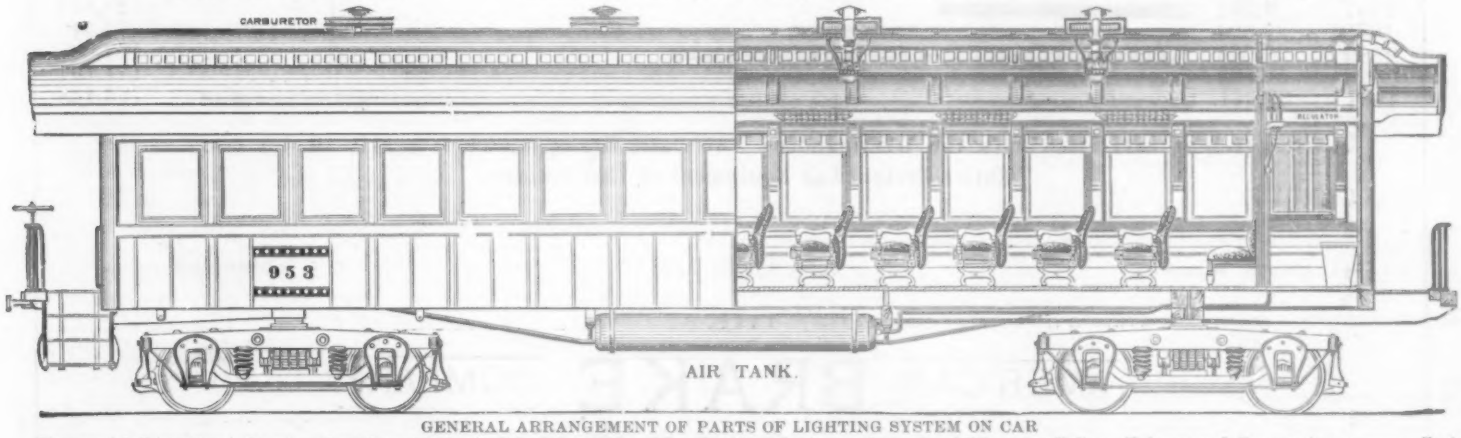
A trial is requested.

Samples free of expense.

THE NATIONAL LOCK WASHER CO, Newark, N. J.

THE FROST DRY CARBURETOR SYSTEM OF CAR LIGHTING.

The Greatest Light of the Age. **Extensively Used by the Pennsylvania Railroad and the Pullman Palace Car Company.**



GENERAL ARRANGEMENT OF PARTS OF LIGHTING SYSTEM ON CAR

It cannot fail to attract the attention of practical railroad managers on account of its absolute safety, durability, simplicity, efficiency and its great economy. Each amp gives 100 candle-power illumination. One hundred hours' continuous service from one charging of the carburetor.

THE RAILROAD LIGHTING & MFG. COMPANY. **Office, 700 and 701 Girard Building, Philadelphia, Pa., U. S. A.**

THE STANDARD THERMOMETER

For Accuracy, Excellence of Workmanship and General Appearance

HAS NO EQUAL.

Adopted by the Pennsylvania, Boston & Albany, Fitchburg and other roads.

SEND FOR CATALOGUE NO. 27.

STANDARD THERMOMETER CO., PEABODY, MASS

GOLD CAR HEATING COMPANY

NEW YORK ADDRESS: N. E. Corner Frankfort and Cliff Sts. **CHICAGO OFFICE: 652 The Rookery, E. H. GOLD, Representative.**

UPWARD OF 4,000 CARS AND LOCOMOTIVES EQUIPPED WITH OUR SYSTEMS OF CAR HEATING.

STEAM COUPLINGS.

Gold's INTERCHANGEABLE, with Gravity Relief Trap.
" UNIVERSAL, " " to couple with SEWEL.
" WESTINGHOUSE TYPE, " " " GIBBS.

We own the Sole Rights under United States Patents to put Traps on Steam Couplings.

Send for Catalogue, etc

A. W. SOPER, PRESIDENT. ROB'T ANDREWS, VICE-PRESIDENT. R. M. DIXON, ENGINEER. C. L. GATELY, SECRETARY. W. R. THOMAS, TREASURER.

The Safety

THE · HEATING · SYSTEMS.

BY HOT WATER CIRCULATION AND DIRECT STEAM WITH REGULATING DEVICES.
RELIABLE AND UNIFORM HEAT. ECONOMICAL AND RAPID CIRCULATION.
GIBBS' AUTOMATIC COUPLER OF WESTINGHOUSE TYPE, ABSOLUTELY STEAM TIGHT.

THE · LIGHTING · SYSTEM.

THE CELEBRATED PINTSCH COMPRESSED OIL GAS METHOD
IN USE ON OVER 40,000 CARS IN EUROPE AND AMERICA.
THE BEST, MOST ECONOMICAL AND ONLY SAFE LIGHT FOR RAILROAD PURPOSES.
IN BRILLIANCY AND CLEANLINESS UNSURPASSED.
THIS SYSTEM HAS BEEN ADOPTED BY THE U. S. LIGHT-HOUSE BOARD FOR LIGHTING BUOYS

Car Heating and Lighting Co.,

160 BROADWAY, NEW YORK.

WM. MARTIN, President, FRANK E. SHAW, Vice-President and Treasurer. W. E. CANDEE, Secretary.

THE MARTIN ANTI-FIRE CAR HEATER

NOW IN USE ON MORE THAN 3,500 CARS AND ENGINES.

ADOPTED ON

Boston & Albany Railroad,
New York Central & Hudson River
Lake Shore & Michigan Southern,
Michigan Central,
Cleve., Col., Cin. & Ind. "Bee Line,
Kings County Elevated,
Dunkirk, Allegheny Valley & Pittsburgh.
New York, Susquehanna & Western,
Cleveland & Canton,
West Shore,
Fall Brook Coal Co.,
Beech Creek Railroad,
Detroit, Lansing & Northern.
North. Cent. Div. of Pennsylvania System,
Union Pacific,
Buffalo, Rochester & Pittsburgh,
Providence & Worcester,
Long Island Railroad,
Elmira, Cortland & Northern R. R. Co.
Lehigh Valley,

AND IN USE ON MANY OTHER RAILROADS.

MANUFACTURERS OF

Martin's Combination Car Heater, DeKalb Ventilating Car Window, Automatic Car Light Extinguisher, Automatic Steam Trap, Reducing Pressure and other Valves Especially Adapted to Steam Car Heating.

WHOLESALE DEALERS IN BRASS AND IRON STEAM FITTINGS, STEEL AND WROUGHT IRON PIPE.

MARTIN ANTI-FIRE CAR HEATER CO., DUNKIRK. N. Y.

ALBANY, N.Y.
TRINITY PLACE.
New York City,
115 BROADWAY.
STEAM COUPLERS AND FIRE PROOF HEATERS.

CONSOLIDATED

McElroy, Sewall, Westinghouse and other Patents.
CATALOGUES UPON APPLICATION.
Special Appliances and Extra Strong Fittings of Every Kind.
AUTOMATIC CONTROL OF HEAT.

CAR-HEATING CO.

CHICAGO;
616 PHENIX BLDG
Canada,
COATICOOK, P. Q.
COMMINGLER, DRUM, AND DIRECT STEAM SYSTEMS.

E. G. KENLY, General Manager. EUGENE CARRINGTON, Gen. Supt.

STORED HEAT IN EARTHENWARE TUBES.

MORTON SAFETY HEATING COMPANY.

BEING USED ON THE FOLLOWING ROADS:

Canadian Railroads:

Intercolonial.

Grand Trunk.

United States Railroads

Chicago, St. Paul, Minneapolis & Omaha.

Norfolk & Western.

Richmond, Fredericksburg & Potomac.

This system of heating is now in successful operation on the GRAND TRUNK and INTERCOLONIAL ROADS OF CANADA, NORFOLK & WESTERN, CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA, RICHMOND, FREDERICKSBURG & POTOMAC, and ROANOKE & SALEM ROADS, of the UNITED STATES.

ONE HEATING in the Coldest Climate keeps a train thoroughly comfortable for two hours, and a pressure of steam afterward, of five minutes in each hour, is sufficient to maintain a uniform temperature of 70 degrees. No overheating and no cold cars. In case of accident there is absolutely NO DANGER OF FIRE, or injury from SCALDING, by escape of steam.

Send for our new circular, showing winter tests and references. For full particulars of cost of equipping trains address

MORTON SAFETY HEATING CO.,

N. Y. Office: Aldrich Court, 45 Broadway. | Baltimore Office: 106 E. Saratoga Street.

New Era Grader, Ditcher and Railroad Builder.

In building railroads makes cuts or fills enbankments for 2 cents per cubic yard, moving ***1,000 to 1,500 cubic yards in 10 hours with six teams and three men.*** Loads 600 to 800 wagons of 1¼ yards in same time at a cost of 2½ cents each. Builds country roads at the rate of one mile in three days. We also make the Austin-Reversible Road Machine, Buck Scraper, Wheel and Drag Scrapers, Contractors' Plows, and Street Sweepers. Send for catalogue.

F. C. AUSTIN MFG. CO., Chicago, Ill.

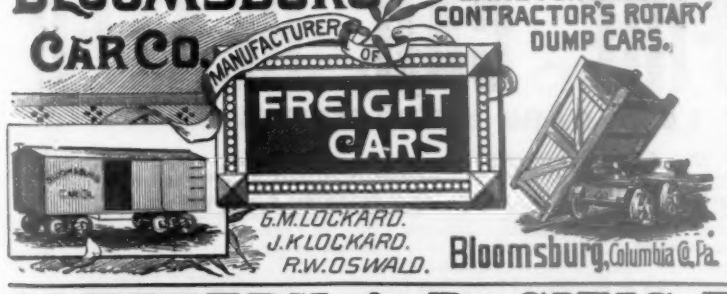
D. A. HOPKINS MFG. CO. LEAD-LINED JOURNAL BEARINGS AND BRASS CASTINGS.

CENTRAL BUILDING 143 LIBERTY ST., N. Y.

Boughton's Safety Car Seal IS THE ONLY CAR SEAL RECOGNIZED BY THE UNITED STATES & ENGLISH GOVERNMENTS

BUFFALO SEAL & PRESS CO., BUFFALO, N.Y., U.S.A.

THE
ALLISON MFG. CO.,
MANUFACTURERS OF
FREIGHT CARS AND LOCOMOTIVE BOILER TUBES,
WROUGHT IRON PIPE OF SUPERIOR QUALITY.
PHILADELPHIA, PA.

BLOOMSBURG CAR CO.
CARS FOR EXPORT
CONTRACTOR'S ROTARY DUMP CARS.


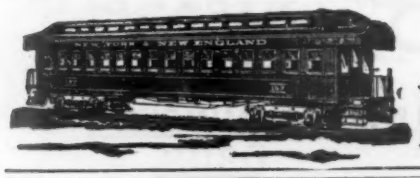
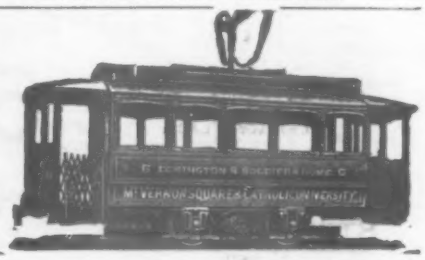
E.M. LOCKARD.
J.K. LOCKARD.
R.W. OSWALD.
Bloomsburg, Columbia Co. Pa.

The Harvey Steel Car and Repair Works.
ARE PREPARED TO BUILD
Steel and Wooden
Freight Cars.
Their repair plant is equipped with modern appliances for
REPAIRING FREIGHT CARS
For Railway and Private Companies.
Special facilities for making all kinds of Car and Railway Forgings.
INQUIRIES SOLICITED. DELIVERY UNSURPASSED.
T. W. HARVEY, Pres. J. D. McILWAIN, Gen'l Superintendent.
E. E. KAUFMAN, Sec. and Treas.
OFFICE: 825 The Rookery, Chicago.
WORKS: HARVEY, ILL., At Crossing Ill. Cent. and C. & G. T.

DELAWARE CAR WORKS.
JACKSON & SHARP COMPANY.
Manufacturers of Passenger, Sleeping, City, Baggage and Freight Cars.
WILMINGTON, DEL.
Cable address "Jackson." Special attention given to Sectional Work for Exportation.

SOUTHERN & PACIFIC REFRIGERATOR CAR CO.
CRITT. A. COX, President. E. D. LEACH, Secy. and Treas.
BUILDER OF THE
SOUTHERN & PACIFIC
STANDARD REFRIGERATOR CAR.
—RIORDAN PATENTS.—
The best Refrigerator Car now in use for Shippers of Dressed Meats, Fruits, Dairy Products and Brewers.

GENERAL OFFICES:
SUITE 1307,
CHAMBER OF COMMERCE
CHICAGO.
CORRESPONDENCE SOLICITED.

J. G. BRILL CO
PHILADELPHIA.
BUILDERS OF
Railway and Tramway Cars



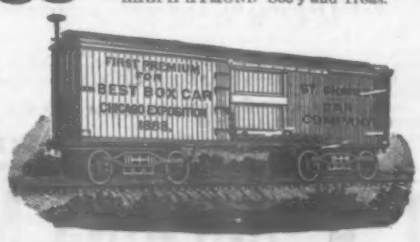
THE ENSIGN MANUFACTURING COMPANY,
Manufacturers of **CARS** for Every Kind of
FREIGHT SERVICE.
Chilled Car Wheels of the Highest Grade only. Axles, Iron and Brass Castings. Capacity: 20 Cars and 400 Car Wheels Daily.
We respectfully solicit your inquiries and specifications.
F. E CANDA, President, C. J. CANDA, Vice-President. J. W. SAVIN, Gen. Agent
11 PINE ST., NEW YORK.
E. ENSIGN, Secretary and Treasurer.
HUNTINGTON, WEST VIRGINIA.

CANDA MANUFACTURING COMPANY,
Manufacturers of **CHILLED CAR WHEELS**
OF THE HIGHEST QUALITY ONLY.
CAR SHOPS IN COURSE OF ERECTION.
OFFICES, No. 11 PINE STREET, NEW YORK CITY.
WORKS AT CARTERET, N. J.
CHARLES J. CANDA, President.
F. MORA CANDA, Treasurer.
FREDERICK HUDSON, Secretary.
FERDINAND E. CANDA, JOHN W. SAVIN, ELY ENSIGN. } Vice-Presidents.

YOUNGSTOWN CAR MFG. CO
Youngstown, Ohio.
RAILROAD FREIGHT CARS
L. E. COCHRAN, Prest. B. F. BOYD, Sec'y and Treas
ANDREW MILLIKEN, Gen. Man.

South Baltimore Car Works
BALTIMORE, MD.
BUILDERS OF RAILROAD FREIGHT CARS
ERIE CAR WORKS, Limited.
Freight Cars of All Kinds.
Capacity, 20 CARS PER DAY. ERIE, PA.

W. H. GLASGOW, President.
H. B. DENKER, Vice-President & Gen. Man.
ST. CHARLES CAR CO
CLARENCE H. HOWARD, Asst. Gen. Man.
RALPH AYMOND Sec'y and Treas.
MANUFACTURERS OF CAR WHEELS, STREET AND MOTOR CARS.
PASSENGER COACHES, BAGGAGE & MAIL CARS.

Box Cars, Stock Cars, Ore Cars, Coal Cars, Flat Cars, Logging Cars, Warehouse Trucks,
Refrigerator, Excursion and Caboose Cars, Hand, Push and Mining Cars, Castings and Forgings


ST. CHARLES. MO.

WASON MANUFACTURING CO., SPRINGFIELD, MASS
Established 1845.) Manufacturers of all descriptions of Railway Cars, Car and Locomotive Wheels, Frogs, Switches and Railway Castings. Employ none but Experienced Workmen, and have on hand a Large and Complete Stock of Seasoned Lumber, sufficient for several years' consumption. Special facilities for furnishing Sectional Work for Exportation.
DAILY CAPACITY, ONE PASSENGER AND SIX FREIGHT CARS. SHIPMENTS MADE FROM NEW YORK OR BOSTON.
G. O. FISK, Pres't.
H. S. HYLE, Treas.
NEW WORKS BUILT 1872. P. O. ADDRESS, BRIGHTWOOD, MASS.

BRAKE SHOES

Licensees of the CONSOLIDATED BRAKE SHOE CO.,

FOR OHIO AND WESTERN STATES: THE CONGDON BRAKE SHOE CO., Monadnock Building, Chicago, Ill.
FOR OHIO AND EASTERN STATES: (CONGDON SHOES) RAMAPO WHEEL & FOUNDRY CO., Ramapo, New York.
FOR OHIO AND EASTERN STATES: (FLANGE SHOES) RAMAPO IRON WORKS, Hillburn, New York.
FOR SOUTHERN STATES: THE ROSS-MEEHAN BRAKE SHOE FOUNDRY CO., Chattanooga, Tenn.

Shoes should be ordered in accordance with the above allotment of territory.

BRADLEY CAR WORKS, WORCESTER, MASS.

ESTABLISHED 1833.

MANUFACTURERS OF EVERY DESCRIPTION OF

RAILWAY CARS.

OSGOOD BRADLEY & SONS, Proprietors.

The Jackson & Woodin Mfg. Co.,

BERWICK, PA.

FREIGHT CARS, CAR WHEELS, CAST IRON WATER AND GAS PIPE, CASTINGS AND FORGINGS.

C. R. WOODIN, Prest. C. H. ZEHNDER, Vice Pres. and Genl. Manager.
WM. F. LOWRY Treas. FRED. H. EATON, Secretary H. F. GLENN, Genl. Supt.

DAVENPORT & FAIRBAIRN.

Chilled Iron Car Wheels.

Capacity, 350 WHEELS PER DAY. ERIE, PA.

MIDDLETOWN CAR WORKS

RAILWAY and MINE CARS.

Works and office on main line Pennsylvania and Philadelphia & Reading Railroads. Arthur King, Prop., Middletown, Pa.

Passenger Car Ventilator.

ALL CINDERS, DUST AND DIRT EXCLUDED.
A SUPPLY OF FRESH AIR GIVEN.

PERRY VENTILATOR CO.,
L. F. BRAINE, Gen'l Sales Agent,
Room 30. 115 Broadway. Boreel Building. New York

THE PARDEE CAR & MACHINE WORKS,

WATSONTOWN, PA.,

Manufacture Mail, Baggage, Box, Gondola, Flat, Gravel, Ore, Coal, Mine and Hand Cars. Patent Turn-Tables and Centres for Wooden Turn-Tables, Car Castings, Railroad Forgings, Rolling-Mill Castings. Bridge Bolts and Castings.

We have in connection with our Car Works an extensive Foundry and Machine Shop, and are prepared to do a general Machine Business.

ARIO PARDEE, Proprietor. S. B. MORGAN, Manager.

TAKE THE

STONINGTON LINE.

ALL FARES REDUCED.

The Inside Route Between New York and Boston, Providence, Worcester and all Eastern Points.

Steamers "Maine" and "New Hampshire" leave New York from new Pier 36, N. R., one block above Canal St., at 5.30 P. M., daily, except Sunday, connecting with 3 Express Trains for Boston. Steamboat Express with *Reclining Chair Cars Free of Charge.*

J. W. MILLER, President. O. H. BRIGGS, G. P. A.

Grand Union Hotel,

SARATOGA SPRINGS, NEW YORK.

The finest Summer Hotel in the world will open June 14 for the Master Car Builders' and Master Mechanics' Conventions.

OFFICE, 115 BROADWAY, WHERE ENGAGEMENTS CAN BE MADE.

WOOLLEY & GERRANS, Proprietors.

PASSENGER, FREIGHT, TENDER.

HINSON COUPLERS

The Hinson Car Coupler Co.,
518 Rookery, Chicago.
31 & 33 B'way N. Y.

Automatic Interchangeable Car Coupling Company,

[CALIFORNIA COUPLER,]

Solid Steel OR Malleable Iron, WITH *Steel Knuckle.*

Simplest, Strongest Best.

F. L. WELLS, General Agent,
116 South Clinton St., Chicago, Ill. (Home Office, San Francisco, Cal.)

THE SURVIVAL OF THE FITTEST."

Van Dorston Cushioned Car Coupling Equipment Co.

VAN DORSTON CUSHIONED CAR COUPLER.

M. C. B. TYPE.

Lightest, Strongest and Best. Automatic Self-Opening and Self-Adjusting. Insures Safety to Trainmen. Independent Double-Acting Gravity Lock. No Slack Required to Uncouple.

Also the **Van Dorston Single, Double and Triple-Acting Cushioned Draught Gear.** Seventy-five per cent. reduction in shocks on the part of the couplers and car bodies, and consequent great economy in repairs. Increase in yard room of from 12 to 18 cars per 1,000. Correspondence respectfully solicited.

Van Dorston Cushioned Car Coupling Equipment Co., No. 305 Walnut St., Philadelphia, Pa.
H. HAMILTON, Superintendent. EDWARD H. JOHNSTON, President.

M. C. B. Standard

Automatic Freight Car Coupler.

Locomotive and Car Axles, Coupling Links and Pins.

M. C. B. Passenger Coupler. Used in Place of Miller Hook Without Change in Platform.

New York Office: 120 BROADWAY. Chicago Office: 941 ROOKERY

St. Louis Office: 319 COMMERCIAL BUILDING.

Gould Coupler Co.

Buffalo Office and Works,

AUSTIN ST.

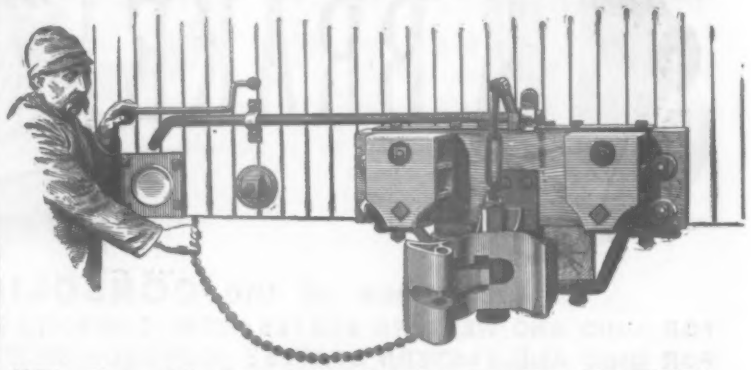
Gould Continuous Platform and Buffer.

Gould Vestibule.

STANDARD COUPLER.

(DOWLING TYPE.)

Drawhead, Malleable Iron; Knuckle, Pressed Steel; Pin, Drop Forged Steel.



With Chain Attachment for Opening the Knuckle WHEN REQUIRED.

THE STANDARD CAR COUPLING CO.,

New York Office, 45 Broadway. Chicago Office, 1018 The Rookery.

W. A. ALEXANDER, President. A. C. McCORD, Vice-President. H. O. NOURSE, Gen'l Agent. M. A. KILVERT, Sec'y. D. W. McCORD, Treas.

DREXEL

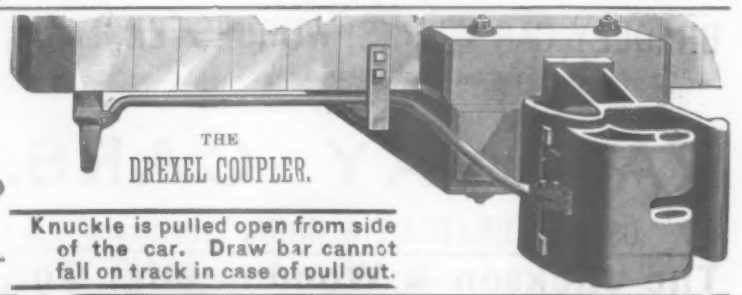
RAILWAY SUPPLY CO.

The DREXEL JOURNAL BOX LID

of Pressed Steel with a Central Bearing Spring. Cost of maintenance reduced to minimum with maximum efficiency.

The Rookery, - - - CHICAGO.

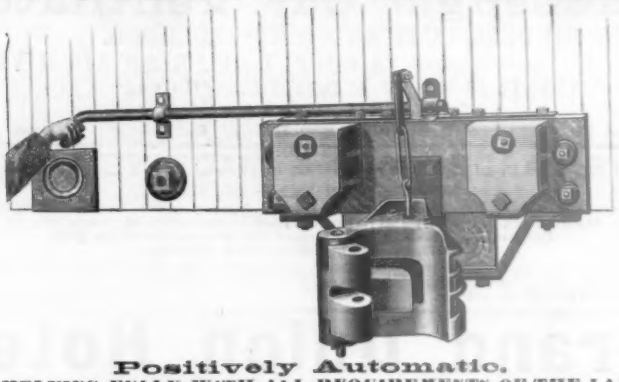
Eastern Office: COLUMBIA BUILDING, NEW YORK.



THE DREXEL COUPLER.

Knuckle is pulled open from side of the car. Draw bar cannot fall on track in case of pull out.

THE POOLEY CAR COUPLER.



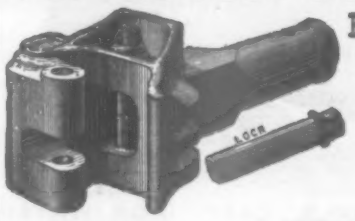
Positively Automatic.

COMPLYING FULLY WITH ALL REQUIREMENTS OF THE LAW.

SIMPLE. STRONG. EFFECTIVE.

PRATT & LETCHWORTH, MANUFACTURERS, BUFFALO, N. Y.

ST. LOUIS STEEL COUPLER,



FREIGHT, PASSENGER AND TENDER COUPLERS.

ST. LOUIS CAR COUPLER CO.,

ST. LOUIS, MO.

WM. V. WOLCOTT, President. HENRY O'HARA, Vice-Prest. GEO. A. BANNANTINE, Secretary.

SMILLIE DOUBLE LOCK COUPLER.

TENSILE STRENGTH (Fairbank's Test) **139,640. DROP TEST, 700** lbs. hammer dropped **18** ft. **22** times failed to break the knuckle.

Direct drop of full sized pin makes a double lock formed by draw bar at "C" and Pin "D." Equally strong if pivot pin "A is lost. Should pin be lost, use any link—no chains being required. The strongest Knuckle and Coupler known. Cannot be unlocked by any jolt of the cars. Couples with all M. C. B. types. The locking pin drops behind the step on rear of Knuckle "K," and keeps the knuckle always open when cars are separated. Removing the pivot pins, 33 loaded gondola cars were drawn from Paterson, N. J., to West End (18 miles), the pull being entirely on the DOUBLE LOCK.

The drawbar is Malleable Iron. The Knuckle Pivot and Locking Pins steel.

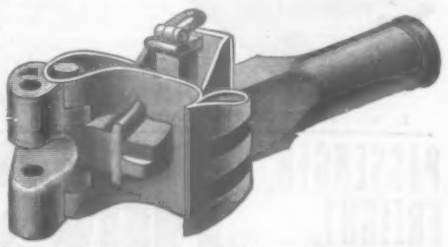
THE SMILLIE COUPLER & MFG. CO.,

52 Broadway, New York. Works, 91 Clay St., Newark, N. J

THURMOND CAR COUPLING COMPANY.

M. C. B. COUPLER FOR FREIGHT, PASSENGER SERVICE, LOCOMOTIVE TENDER HOOKS, SPECIAL CARRIER IRONS, ROD BRACKETS AND ADJUSTABLE LINKS. SOLE OWNERS OF FLANGE AND GROOVE METHOD OF INTERLOCKING KNUCKLE AND DRAWHEAD, TAKING STRAIN FROM PIVOT PIN.

Tested to 150,240 lbs. tensile strain, without using pivot pin, on Fairbanks' testing machine. Highest test ever made. N. O. Olsen, Engr.



Office, 80 Broadway, New York.

E. RAGAN, Pres. T. W. GETMAN, Gen. Man. T. L. McKEEN, Supt.

TROJAN CAR COUPLER.

M. C. B. TYPE.

THE STRONGEST AND THE ONLY SAFETY COUPLER.

The knuckle may be thrown open for coupling by the hand-rod at the side of the car, rendering it unnecessary for trainmen to go between the cars to open the knuckle. The action is positive, and not dependent on springs or gravity.

The lock has a bearing of four square inches on the knuckle.

N. O. Olsen, Engineer of Fairbanks & Co.' testing department, says: "IT IS THE STRONGEST COUPLER NOW IN THE MARKET

THE TROJAN CAR COUPLER CO.,

New York Office, 11 Pine street. TROY, N. Y

See the other ad.

McGILL

THE VERTICAL PLANE MUST GO

SETTLES THE QUESTION.

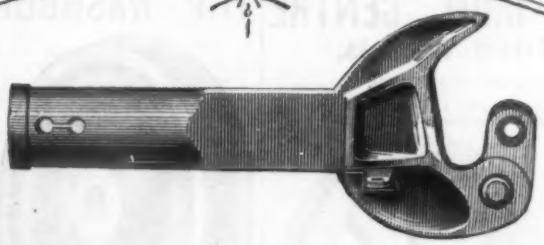
Worlds Fair

Freight Passenger CAR

McGILL IRON WORKS CO. PEORIA, ILL.

Couplers.

THE JANNEY FREIGHT CAR COUPLER



THE McCONWAY & TORLEY CO.

W. McCONWAY,

PRESIDENT.

48th ST. & A. V. R. R. PITTSBURGH, PA.

Agents & Manufacturers For

THE JANNEY-HIEN COMPANY

THE BUCKEYE COUPLER.

W. F. GOODSPEED, President.
R. M. ROWND, Vice-President.
S. P. PEABODY, Secretary and Treasurer.

E. J. EAMES, Western Agent,
Phenix Building, CHICAGO, ILL.

Adopted as Standard by Several Leading Railroads After Severe Tests and Long Trials.

OFFICE:
Y. M. C. A. BUILDING.
MANUFACTORY:
BUCKEYE MALLEABLE IRON CO
COLUMBUS, OHIO.

Master Car Builders' Standard in every particular. Combines the greatest obtainable strength and simplicity. Only Three Parts. Positive acting gravity lock and positive mechanical opening of knuckle. Absolute Central draft. Same movement that raises the lock throws open the knuckle.

THE BUCKEYE AUTOMATIC CAR COUPLER CO., Columbus, Ohio.

JOHNSTON CAR COUPLING COMPANY,

204 WALNUT PLACE, PHILADELPHIA, PA.

LIGHTEST COUPLER IN THE MARKET.

WEIGHT, 180 TO 185 LBS.

MEETS ALL THE REQUIREMENTS OF THE M. C. B. TESTS.

The Knuckle is made of a special brand of steel, such as is furnished to the U. S. Government to stand 60,000 lbs. per square inch, and 20 per cent. to 25 per cent. elongation.

Locking Device, simple, durable and effective. Impossible to unlock without lever or rod. It has but a small number of parts

KNUCKLE OPENS AUTOMATICALLY.

THE BALTIMORE CAR WHEEL COMPANY

MANUFACTURERS OF

CHILLED WHEELS OF ALL PATTERNS AND SIZES FOR EVERY SERVICE, AND WITH OR WITHOUT AXLES.

CAPACITY, 400 WHEELS PER DAY.

W. S. G. BAKER, *President and Treasurer.*
J. PAUL BAKER, *Secretary.*

OFFICE AND WORKS: Fulton Junction, Baltimore, Md.

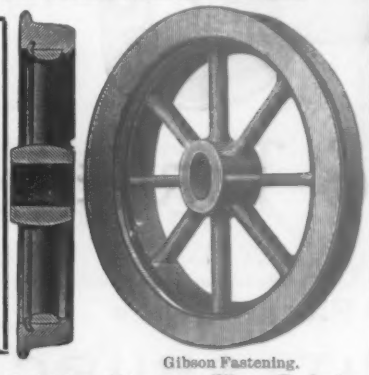
COCKERILL'S WROUGHT IRON CENTRE

Spoke and Disc Steel Tired Wheels,

OF AMERICAN STANDARD.

For Locomotive Driving Wheels, Locomotive Tender and Truck Wheels and Passenger Car Wheels.

Fourteen years of constant service on the Pennsylvania R. R. and over 25 years of service on the most important roads of Europe is the record of our wheels.

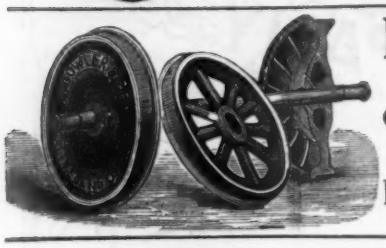


Gibson Fastening.

Mansel Retaining Rings or Gibson Fastening.

Adopted as Standard Wheel on some of the Principal Roads in this country. Apply for Catalogue.

CHAS. G. ECKSTEIN & CO., Sole Agents,
41 John St., New York.



BOWLER & COMPANY,

Nos. 10 to 24 Winter St., CLEVELAND, O.

MANUFACTURERS OF

Car Wheels of all Kinds and Sizes, with or without axles.

Railroad Building and Heavy Castings A SPECIALTY.

THE KRUPP SYSTEM

OF

AMERICAN STANDARD

STEEL-TIRED WHEELS

CAST-STEEL WORKS

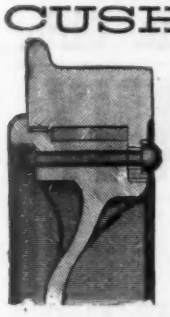
Of FRIED. KRUPP, Essen, Germany.

REPRESENTED BY

THOMAS PROSSER & SON

15 Gold Street, New York.

CUSHION CAR WHEEL



RECORD 40,000 MILES.
1-16 INCH WEAR.

Simplicity.
Durability.
Economy.
Elasticity.
Safety.
Noiseless.

For Coaches, Locomotives and Tender Trucks on Elevated, Electric and Street Railroads Two pieces only. Centre never removed from axle. Tire renewed in any shop. Cushion absorbs all vibrations or undue stress and thrusts. One half more mileage than any other wheel made.

SEND FOR CIRCULAR.

CUSHION CAR WHEEL CO., {INDIANAPOLIS, IND., and GRAND PACIFIC HOTEL, CHICAGO.

THE WASHBURN CAR-WHEEL COMPANY

HARTFORD, CONN.

CRUCIBLE

STEEL-TIRED WHEELS,

For Parlor and Sleeping Cars, Passenger Coaches, Locomotive and Tender Trucks.

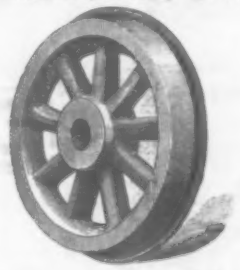
CAST-IRON CENTRES

WELDED TO

Hammered & Rolled Crucible Steel Tires.

AMERICAN STEEL WHEEL COMPANY,

JNO. C. PAUL, President.
J. H. OLHAUSEN, Vice-Prest.
G. W. CUSHING, Superintendent.
SAM'L GARWOOD, Secretary and Treasurer.



MANUFACTURERS OF

SOLID STEEL LOCOMOTIVE DRIVING WHEELS, SOLID STEEL LOCOMOTIVE LEADING TRUCK WHEELS.

These wheels can be used until tire is worn down, when flange may be turned off, and a new tire shrunk on. We can equip trains with Solid Steel Wheels, including Locomotive Drivers, from pony truck to last car. We also make M. C. B. Knuckles for repairs and a general line of R. R. Steel Castings. Correspondence Solicited.

GENERAL OFFICE: CENTRAL BUILDING, 143 LIBERTY STREET.

THE

Standard Steel Works,

MANUFACTURERS OF

Locomotive and Car-Wheel

TIRES.

OFFICE: 220 SOUTH FOURTH ST.
Philadelphia, Pa.

LATROBE STEEL WORKS

MANUFACTURERS OF

TIRES

FOR LOCOMOTIVE AND CAR WHEELS.

Works and Main Office, Latrobe, Pa.

Branch Office. 251 S. 4th St., Philadelphia

10 WALL ST., NEW YORK
237 FRANKLIN ST., BOSTON
719 PHOENIX BUILDING, CHICAGO

FRANK S. LAYNG, CHAIRMAN. C. R. KEARNS, SECRETARY AND TREAS

PICKERING SPRING CO., Limited

MANUFACTURERS OF

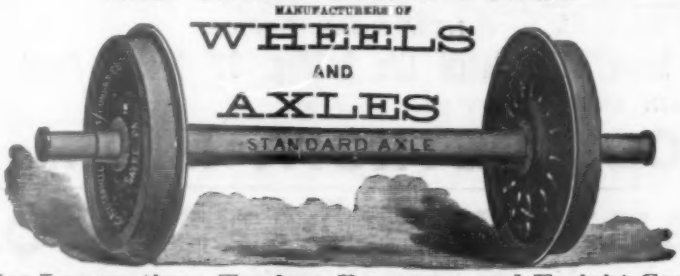
Railway Springs of Every Description

PHILADELPHIA

THE CAYUTA WHEEL AND FOUNDRY CO
AND SAYRE STEAM FORGE

MANUFACTURERS OF

WHEELS
AND
AXLES



For Locomotives, Tenders, Passenger and Freight Cars.
RAILROAD CASTINGS AND HEAVY FORGINGS.
HOWARD ELMER, Pres. F. E. LYFORD Treas. M. C. CHAPMAN, Supt.
SAYRE PA.

LOBDELL CAR WHEEL CO., WILMINGTON, DEL.
Established 1836.

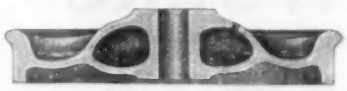
Double Plate, Single Plate AN Hollow Spoke WHEELS FOR Broad and Narrow-Gauge Cars Engines and Tenders.

Also OPEN AND Solid Plate STREET CAR WHEELS Either in the Rough or Fitted on Axles.

CAPACITY, 500 WHEELS PER DAY.

TAYLOR IRON & STEEL CO.

SUCCESSORS TO "THE TAYLOR IRON WORKS,"
HIGH BRIDGE, NEW JERSEY, on line of C. R. R. of N. J.
NEW YORK OFFICE: ROOM 505 CENTRAL BUILDING, LIBERTY AND WEST STS.



—MANUFACTURERS OF—
Steel Tired Car Wheels, Chilled Iron Car Wheels, Car and Locomotive Axles, Iron and Steel Forgings.

PITTSBURGH FORGE AND IRON COMPANY
CALVIN WELLS, Pres. & Treas. MANUFACTURERS OF F. E. RICHARDSON, Secy.

MERCHANT IRON,

Draw-Bars, Links and Pins, Follower Plates, Railroad Forgings, Arch Bars, Splice Bars, Track Bolts, Bridge Rods with Plain or Upset Ends. All Sizes.
Office: Tenth Street, near Penn Avenue, Pittsburgh, Pa.

THE JERSEY CITY WHEEL FOUNDRY AND MACHINE WORKS
HIGH GRADE CHILLED CAR WHEELS
ALL WHEELS GUARANTEED TO STAND 60,000 MILES

THE RAILROAD GAZETTE

has more Railroad Officers as subscribers and readers than all other railroad papers combined. Its advertising rates are no higher than those of papers having less than half its circulation

NEW DEPARTURE IN RATCHET DRILLS

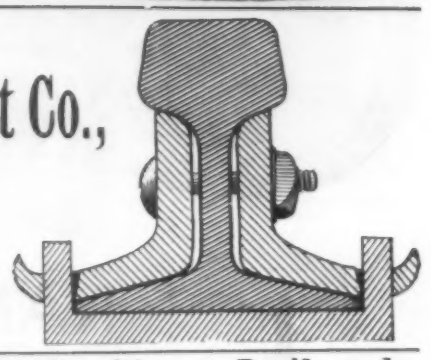
SCHUTTLER MFG. CO.

FRANK BAKEMAN & CO., 6 Rotunda, Rookery, Chicago, GENERAL AGENTS.
AVERY & WEST, 450 Rookery, Chicago, WESTERN AGENTS.

The movement of the handle in **either direction** causes a **continuous drilling**, thus doing the work in **half the time** of any other ratchet drill **without additional labor.** The drill is strong, durable and easily operated, the working parts being completely protected from dust and weather.

Eno Rail Joint Co.,

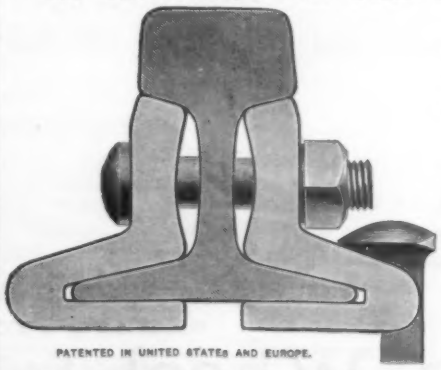
NEWARK, N. J.



The Coming Joint for Steam Railroads,

ELECTRIC and CABLE STREET RAILWAYS.

IN SUCCESSFUL USE ON 48 ROADS.



PATENTED IN UNITED STATES AND EUROPE.

By its use the rail is made as strong at the joint as it is at the centre of the rail as it lies in track.

It is simple and easily applied, and has always given satisfactory results.

It is the safest joint to use, and cheaper in the long run than the angle bar.

It will increase the life of the rail over 25 per cent.

CONTINUOUS RAIL JOINT COMPANY OF AMERICA,
Broad and Market Sts., Newark, N. J.

THE STANDARD COMBINATION TIE PLATE AND BRACE

POSSESSES THE FOLLOWING MERITS:

1. It prevents absolutely the canting of the rail into the tie, thereby greatly increasing the life of the tie.
2. It prevents the rails from spreading or canting over and wearing one side only.
3. The combination of the brace and plate obviates the necessity of spiking the rail and brace separately, thereby saving two spikes and securing the service of the *inside* spike for *holding* the rail; it also prevents the rail from working up and down, and laterally, thus making it impossible to wear the *neck of the spike.*
4. The plate and brace being made of malleable iron, is practically indestructible.

The tie plate and brace is especially useful for curves and guard rails, and also on bridges, whether the rail is laid on ties or on stringers. A tie plate without a brace will not save the head of the spike. A brace without a tie plate will not save the tie, and in a short time the rail will wear into the tie.

P. O. Box 288, PHILADELPHIA, PA. WILLIAM H. PHILLIPS.

THE ANDRESS PAINT AND COLOR COMPANY
MANUFACTURERS OF EVERY DESCRIPTION OF
RAILWAY AND MARINE PAINTS
15 CORTLANDT ST. NEW YORK

THE

FONTAINE CONTINUOUS RAIL CROSSING

(For Description See Railroad Gazette of Dec. 18, 1891)

THE MOST ECONOMICAL. ABSOLUTE SAFETY.

HIGH RATE OF SPEED WITHOUT ANY JAR.

CHICAGO OFFICE:
Room 320, Home Insurance Office, 205 La Salle Street.

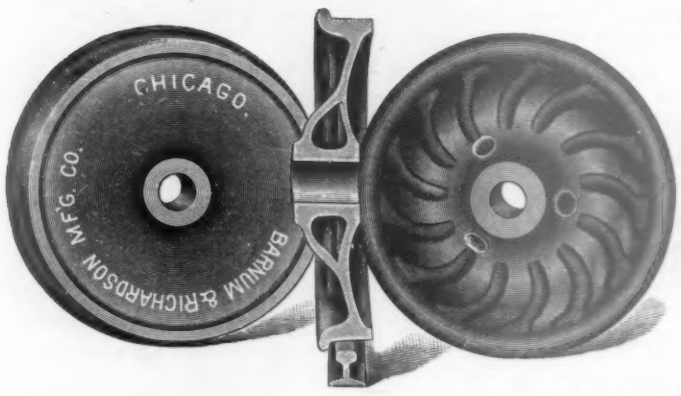
NEW YORK OFFICE:
Room 615, Mutual Life Building, 32 Nassau Street.

WORKS AND MAIN OFFICE:

FONTAINE CROSSING CO., DETROIT, MICH.

BARNUM & RICHARDSON MFG. CO.,

Office, 64 South Jefferson St., CHICAGO, ILL.



—MANUFACTURERS OF—

LOCOMOTIVE,
PASSENGER,
FREIGHT

—AND—

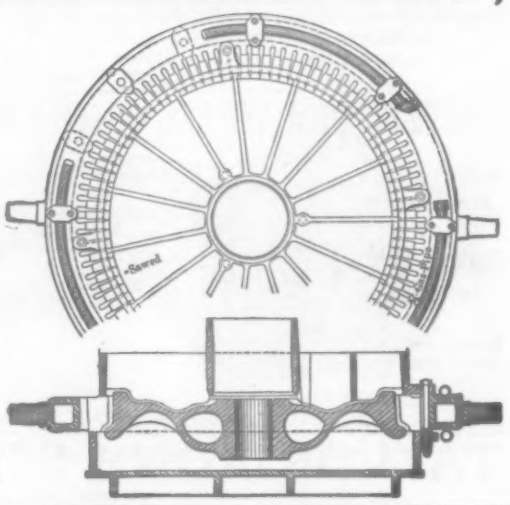
STREET CAR WHEELS,

IN THE

Barr Contracting Chills.

Salisbury Charcoal Pig Iron.
Street Railway Curves,
Crossings, Frogs and
Switches.

Machinery and Heavy Castings of all descriptions. Wheels are made perfectly cylindrical, uniform in chill, and with treads ground.



RAMAPO IRON WORKS

HILLBURN ROCKLAND COUNTY, N. Y.

MANUFACTURERS OF

Switches, Automatic Safety Switch Stands, Yoked Frogs
Bolted Plate and Spring Rail Frogs, Automatic
Distant Signals Interlocked with Switches,
Crossings of Every Description.

LIGHT AND HEAVY CASTINGS AND GENERAL TRACK EQUIPMENT

Automatic Stand, Showing Position of Parts while being Thrown by Hand.

RAMAPO "YOKED FROG."

Automatic Stand, Showing Position of Parts while being Thrown Automatically by Train.

Ramapo Wheel & Foundry Company

MANUFACTURE

CHILLED IRON CAR WHEELS

FROM SPECIAL QUALITY CHARCOAL IRON

FOR

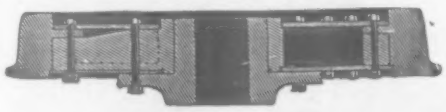
Drawing Room and Sleeping Coaches, Locomotives, Tenders and Passenger and Freight Cars.

Congdon Brake Shoe. Raoul Journal Box.

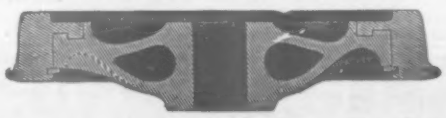
Snow's Rigid Steel-Tired Wheels,

WITH TIRES HAVING ANNULAR WEBS.

BOLTED--WITH WROUGHT-IRON PLATES, CAST-IRON CENTRE AND INTERCHANGEABLE HUB.



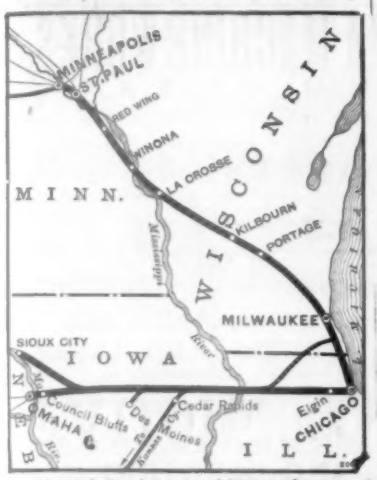
EOLTLESS--WITH CAST-IRON DOUBLE PLATE OR SPOKE CENTRE AND WEDGE-SHAPED RETAINING RING.



Both of these Wheels can be Re-tired in any Ordinary Machine Shop

OFFICE AND WORKS, RAMAPO, N. Y

DON'T MAKE MISTAKES,
but patronize the Electric Lighted, Steam Heated Vestibuled Trains of the
Chicago, Milwaukee & St. Paul Railway.



Through cars between Chicago and Portland, Oregon, via St. Paul & Nor. Pac. R. R., and through cars between Chicago and Denver, Colo., via Omaha and the B. & M. R. R. For further particulars apply to nearest Ticket Agent or address GEO. H. HEAFFORD,
Gen'l Pass'r Ag't, CHICAGO, ILL.

between **CHICAGO** and
New York, Boston and the East.

NEW YORK & NEW ENGLAND R. R.

New York and Boston Trains

ve either city.....	12:00 m	*3:00 p. m.
. at termini.....	6:30 p. m.	*9:00 p. m.

TICKET OFFICES:
Grand Central Station, New York; 322 Washington Street, Boston.

* :00 p. m.—The "White Train."—Runs daily, including Sundays.

Parlor and Dining Cars

TRAVEL VIA THE
Burlington Route
C.B.&Q.R.R.
TO ALL
POINTS WEST, NORTHWEST, and SOUTHWEST.

P. S. EUSTIS, Gen. Pass. and Ticket Agent
CHICAGO, ILL.

CHICAGO AND NORTH-WESTERN RAILWAY.

OVER 7,000 MILES
Of steel track in Illinois, Iowa, Wisconsin, Michigan, Minnesota, Nebraska, Dakota and Wyoming, penetrates the Agricultural, Mining and Commercial Centres of the
WEST and NORTHWEST
The Unrivaled Equipment of the Line embraces Sumptuous Dining Cars, New Wagner and Pullman Sleepers, Supurb day Coaches and
FAST VESTIBULED TRAINS
Running direct between Chicago, St. Paul and Minneapolis, Council Bluffs and Omaha, connecting for Portland, Denver, San Francisco and all Pacific Coast Points.
ONLY LINE TO THE BLACK HILLS
For Tickets, Rates, Maps, Time Tables and full information, apply to any Ticket Agent or address the Gen'l Passenger Agent, Chicago, Ill.

J. M. WHITMAN, General Man. H. C. WICKER, Traffic Man. W. A. THRALL, G. P. & P. A.

"SPRINGFIELD LINE"
Limited Trains
—LEAVE—
BOSTON and NEW YORK
—AT—
12:00 NOON, DUE 5:40 P. M.
—ONLY—
5 Hours and 40 Minutes.

The equipment of above trains will consist of baggage car, drawing room smoking car and two drawing room cars.

FARE $6.00
Including seat in drawing room car.

Tickets will not be sold beyond the seating capacity of the train.

A. S. HANSON,
General Pass. Agent.

SOLID TRAINS TO OMAHA

Vestibuled, electric lighted and steam heated, with the finest Dining, Sleeping and Reclining Chair Car service in the world, via the "Chicago & Omaha Short Line" of the Chicago, Milwaukee & St. Paul Railway. Double daily train service, with no transfer at Council Bluffs as heretofore. Apply to nearest coupon ticket agent for tickets and further information, or address

GEO. H. HEAFFORD,
Gen'l Pass. Agent.
Chicago, Ill.

ERIE LINES

SOLID TRAINS
—BETWEEN—
NEW YORK AND CHICAGO,
Via Chautauqua Lake or Niagara Falls.
An Enchanting Panorama of Mountains Forests and Streams.
PULLMAN CARS
Between New York and Rochester, Buffalo Niagara Falls, Toronto, Chautauqua Lake, Cleveland, Cincinnati and Chicago.
D. I. ROBERTS, Gen'l Pass. Agt.

Short and Direct Through Car Line
BETWEEN
CINCINNATI, INDIANAPOLIS AND CHICAGO.
Private Compartment Buffet Sleeping Cars, Standard Wagner Palace Sleeping Cars and Elegant Reclining Chair Cars on Night Trains; Luxurious Parlor and Cafe Dining Cars on Day Trains.
THE SOUTHWESTERN LIMITED,
FROM ST. LOUIS, INDIANAPOLIS AND CINCINNATI
TO NEW YORK AND BOSTON,
is the finest train in America, and provides the best and quickest service ever offered between the East and the West, landing passengers in the heart of New York City without ferry transfer.
OSCAR G. MURRAY, Traffic Manager, D. B. MARTIN, Gen. Pass. Agt.,
CINCINNATI, O.

CHICAGO & ALTON RAILROAD.
Ladies Palace Day Cars and Palace Reclining Chair Cars Free of Extra Charge, Pullman Palace Buffet Compartment Sleeping Cars, and Palace Dining Cars.
PULLMAN VESTIBULED TRAINS
Free of Extra Charge, and no Change of Cars of any Class Between
CHICAGO AND KANSAS CITY, CHICAGO AND DENVER
CHICAGO AND ST. LOUIS, and ST. LOUIS AND KANSAS CITY.
Pioneer Pullman Palace Sleeping Car, Palace Dining Car, and Free Palace Reclining Chair Car Line.
JAMES CHARLTON, General Passenger and Ticket Agent,
210 Dearborn Street, Corner Adams Street. CHICAGO, ILL.

NEW YORK CENTRAL & HUDSON RIVER R. R.
THE GREAT FOUR-TRACK TRUNK LINE OF AMERICA.
All through trains arrive at and depart from Grand Central Station, Fourth Ave. and 42d Street, New York, the very centre of the city.
THE DIRECT LINE BETWEEN NEW YORK AND NIAGARA FALLS
Wagner Palace Sleeping and Drawing-Room Cars on all through trains.
JOHN M. TOUCEY, General Manager. GEO. H. DANIELS, General Passenger Agent.

ILLINOIS CENTRAL RAILROAD.
Through Line of Free Reclining Chair Cars and Pullman Palace Sleepers between Chicago and St. Louis. Direct Connection in Union Depot for all points diverging
The SHORTEST ROUTE from CHICAGO to CAIRO, MEMPHIS and NEW ORLEANS, making DIRECT CONNECTION for LITTLE ROCK, HOT SPRINGS, FT. WORTH and ALL POINTS in ARKANSAS and TEXAS; also for NASHVILLE, CHATTANOOGA, VICKSBURG, MOBILE, and ALL POINTS SOUTH and SOUTHEAST.
Through Train of Free Reclining Chair Cars and Pullman Palace Sleepers between Chicago and Springfield.
The SHORTEST and MOST DIRECT ROUTE from CHICAGO to ROCKFORD, DUBUQUE, WATERLOO, CEDAR FALLS, SIOUX CITY, SHELDON, ROCK RAPIDS and SIOUX FALLS, making DIRECT CONNECTION at SIOUX CITY with UNION PACIFIC RAILWAY for ALL POINTS in NEBRASKA, COLORADO, UTAH, WYOMING and THE PACIFIC COAST.
For Tickets, Rates and all information apply to any Coupon Ticket Agent in the United States or Canada, or address
T. J. HUDSON, Traffic Manager. A. H. HANSON, General Passenger Agent.

General Freight Department.
THROUGH LINE WITHOUT TRANSFER OF FREIGHT
To principal points in Illinois, the West and Northwest: also to New Orleans, Memphis and points in the South, Southeast, Texas and Mexico.
HORACE TUCKER, General Freight Agent,
Chicago, Ill.

THE GREATEST THROUGH CAR LINE
BETWEEN THE EAST AND WEST.
THE LAKE SHORE ROUTE
Wagner Sleeping, Drawing Room and Private Compartment Cars between New York, Boston, Albany, Buffalo, Cleveland, Toledo, Chicago, Cincinnati and intermediate cities.
Route of the New York and Chicago Limited, Boston and Chicago Special and U. S. Fast Mails.
ONLY DOUBLE-TRACK LINE TO WORLD'S FAIR.
W. H. CANNIFF, Gen. Supt., Cleveland, O. A. J. SMITH, G. P. & T. A.

CH&D
CINCINNATI, HAMILTON & DAYTON R.R.
THE FINEST ON EARTH.—The Cincinnati, Hamilton & Dayton R.R. is the only line running Pullman's Perfected Vestibule Trains, with chair parlor, sleeping and dining-car service between Cincinnati, Indianapolis and Chicago, and is the only line running through reclining-chair cars between Cincinnati, Keokuk and Springfield Ill., and combination chair and sleeping-car Cincinnati to Peoria, Ill., and the Only DIRECT LINE between Cincinnati, Dayton, Lima, Toledo, Detroit, the Lake Regions and Canada. The road is one of the oldest in the State of Ohio and the only line entering Cincinnati over 25 miles of double track, and from its past record can more than assure its patrons speed, comfort and safety. Tickets on sale everywhere, and see that they read C., H. & D., either in or out of Cincinnati, Indianapolis or Toledo. E. O. McCORMICK, Gen. Pass. and Tkt. Agent.

MISSOURI PACIFIC RAILWAY
4 DAILY TRAINS 4
ST. LOUIS TO KANSAS CITY.
THE COLORADO SHORT LINE TO PUEBLO AND DENVER
EQUIPPED WITH PULLMAN BUFFET SLEEPING CARS.
IRON MOUNTAIN ROUTE. 3 DAILY TRAINS 3.
To Texas and the Southwest. The Shortest and Quickest Line to the City of Mexico, with only one change at Laredo.
ONLY ONE CHANGE OF CARS ST. LOUIS TO SAN FRANCISCO.
S. H. H. CLARK, 1st V.-Pres. & Genl. Mangr. H. C. TOWNSEND, Genl. Passr. and Ticket Agent

PENNSYLVANIA RAILROAD.
GREAT TRUNK LINE AND UNITED STATES MAIL ROUTE. THE BEST CONSTRUCTED AND MOST COMPLETELY EQUIPPED RAILWAY IN AMERICA.
Connecting **all the principal cities on the Atlantic coast** with those in the **Mississippi Valley** and on the **Great Lakes. Through trains with Pullman Vestibule Cars attached, between New York, Philadelphia, Washington and Baltimore and Chicago, St. Louis, Cincinnati and Louisville.**
Baggage Checked to Destination. Fare always as low as by any other route.
For tickets, palace and parlor car accommodations, and all desired information, apply at the offices of the company: No. 205 Washington street, **Boston**; No. 1 Astor House, Nos. 435, 849 and 944 Broadway, and Desbrosses and Cortlandt street Ferries, **New York**; Nos. 838 and 1348 Chestnut street, and Broad Street Station, **Philadelphia**; N. E. corner Baltimore and Calvert streets, Union Station and Northern Central Railway Station, **Baltimore**; N. E. corner Thirteenth street and Pennsylvania avenue, and Baltimore and Potomac Railroad Station, **Washington City.**
CHAS. E. PUGH, General Manager. J. R. WOOD, General Passenger Agent.

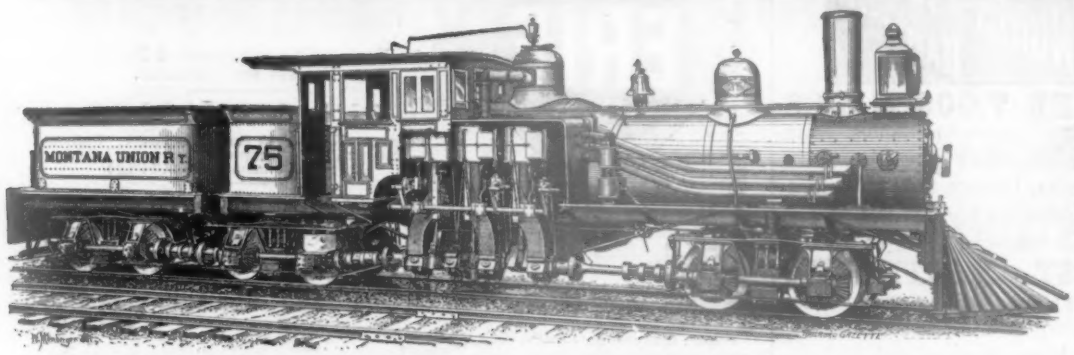
Hoosac Tunnel Route
FITCHBURG RAILROAD.
Short line between the East and West. Sleeping and drawing-room cars on all express trains
J. R. WATSON,
General Passenger Agent.

Machinery for Coaling Locomotives.
Before you forget it, send for Catalogue No. 7 to
C. W. HUNT CO.,
45 BROADWAY, NEW YORK.

J. G. HENDRICKSON,
F. J. CLAMER,
Co-Partners.

AJAX BEARINGS DON'T GET HOT.

AJAX METAL CO.,
Philadelphia, Pa.

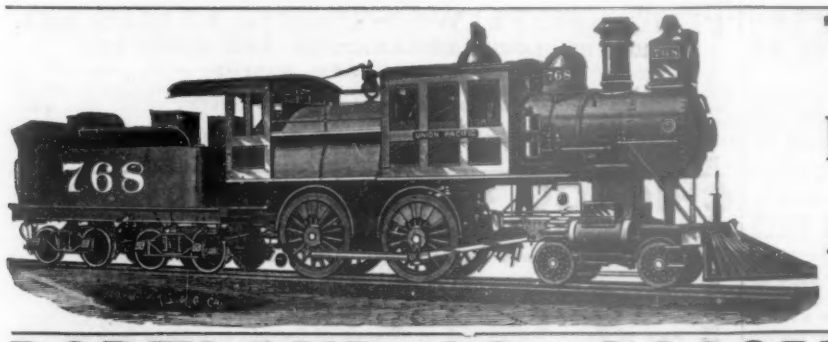


LIMA MACHINE WORKS,

LIMA, O., U. S. A.,
SOLE MANUFACTURERS OF THE
Shay Patent Locomotive Engines,

Built to weigh from 7 tons up to 90 tons on drivers and are especially adapted for service on roads where there are heavy grades and sharp curves. These locomotives are working successfully on grades of 9¼ per cent., and on curves of 100 feet radius. We also build

Standard Types of Light Locomotives,
Mining Cars of all Kinds,
CAR WHEELS AND AXLES.
Write for Particulars.



WOOTTEN LOCOMOTIVE

MECHANICAL AND ELECTRIC
INTERLOCKING AND BLOCK SIGNAL SYSTEMS.
Every Variety of Track Supplies. Heavy Tools.
MACHINISTS AND MANUFACTURERS.
THE WHARTON RAILROAD SWITCH CO.
125 South Fourth Street, Philadelphia, Pa.

PORTLAND CO., LOCOMOTIVES AND CARS.

PORTLAND, MAINE.
FRANKLIN C. PAYSON, President. BYRON D. VERRILL, Treasurer. JAMES E. GREENSMITH, General Manager.

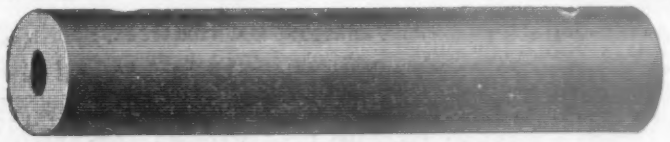
H. K. PORTER & CO.

Pittsburgh, Pa.
LIGHT LOCOMOTIVES
And Noiseless Street Motors,

And for all gauges of track. All work steel fitted and interchangeable. Duplicate parts kept in stock.
Illustrated Catalogue mailed on application.

This cut changed weekly.

FALLS HOLLOW STAYBOLT CO.,



CUYAHOGA FALLS, O.
Rolled Hollow Staybolts Are Stronger and Safer than Drilled Ones.
Mandrel rolled from the finest charcoal iron. All sizes, from ⅜ to 1½ inch, with any sized hole required from ⅛ to ⅞ inch. Let us send you a sample and quote prices.
A set for one firebox will convince you of their merits, safety and economy.

IMPROVED LOCOMOTIVE STEAM GAUGE

SPRINGS MADE FROM
Special Seamless Drawn Tubing.
The ONLY Locomotive Steam Gauge made where the Movement, Springs and all Moving Parts are Detached from the Back of the Case.
Case Fitted with our Patent Elastic Packing to Prevent Dust and Moisture from Entering Gauge.
The Ashcroft Mfg. Co.
Factory, Bridgeport, Conn. Office, 111 Liberty Street, New York City.

FULLER BROTHERS & CO

139 GREENWICH STREET, NEW YORK,
SOLE AGENTS FOR
DOVER IRON CO. OF NEW JERSEY.
BOILER RIVETS, BRACE JAWS, STAY BOLT IRON
ALSO
NUTS, BOLTS AND WASHERS.

RHODE ISLAND TOOL CO.,

Cold Punched Square and Hexagon Nuts.
(Chamfered and Trimmed with Drilled Holes).
Finished Case-Hardened Hexagon Nuts.
Engineers' Steel Wrenches.
Machine Bolts.
Rough and Milled Studs.
Cap and Set Screws.
Turn Buckles.
Drop Forgings to Order.
PROVIDENCE, RHODE ISLAND.

RICHARDSON & ALLEN-RICHARDSON

BALANCED SLIDE VALVES.
NEW PATENT APRIL, 1891.
6,000 Locomotives Equipped. In use on 175 Railroads.
MANUFACTURED ONLY BY
M. C. HAMMETT,
SUCCESSOR TO
ESTATE OF F. W. RICHARDSON, TROY, N. Y.

TUBULAR JOURNAL BEARINGS

Enable railway cars to be started with but one-tenth the power required with ordinary brasses. Thirty (30) per cent. coal saving realized with trains of four or more cars. Journal heating entirely done away with by removing the cause. Cost of lubrication practically nothing, and every bearing guaranteed to yield 200,000 miles of service. Great economy and uniform reliability secured.
THE MENEELY BEARING COMPANY, West Troy, N. Y.

THOMAS PROSSER & SON
15 Gold Street, New York.

KRUPP'S STEEL TIRES

On Locomotive Driving Wheels.
GIVE THE BEST RESULTS
For Every Variety of Service.

BALDWIN LOCOMOTIVE WORKS,
ESTABLISHED 1831.
Annual Capacity,
1,000.

COMPOUND LOCOMOTIVES

And Locomotives adapted to every variety of service, and built accurately to standard gauges and templates. Like parts of different engines of same class perfectly interchangeable. Broad and Narrow Gauge Locomotives; Mine Locomotives by Steam or Compressed Air; Plantation Locomotives; Furnace Locomotives; Noiseless Motors for Street Railways, etc

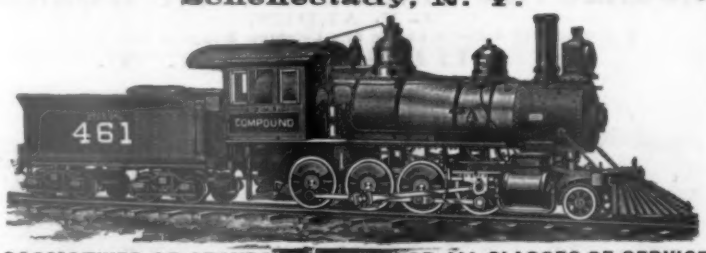
BURNHAM, WILLIAMS & CO., Proprietors, PHILADELPHIA, PA.

ESTABLISHED IN 1865.
Richmond Locomotive & Machine Works,
RICHMOND, VIRGINIA,

Builders of LOCOMOTIVES for all classes of service to standard designs and specifications.

DICKSON MANUFACTURING CO.
BUILDERS OF
Standard and Narrow-Gauge
LOCOMOTIVES.
Scranton. Pa.
JAS. P. DICKSON, President. WM. H. PERKINS, Secretary and Treasurer.
SIDNEY BROADBENT, Gen'l Supt. JOHN DEVINE, Superintendent.

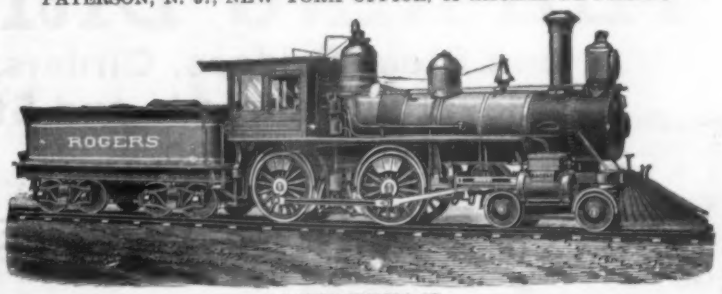
EDWARD ELLIS, Prest. WALTER MCQUEEN, V.-Prest. WM. D. ELLIS, Treas. ALBERT J. PITKIN, Supt.
SCHENECTADY LOCOMOTIVE WORKS,
Schenectady, N. Y.



LOCOMOTIVES OF STANDARD DESIGN FOR ALL CLASSES OF SERVICE
Or from Designs Furnished by Railroad Companies.
ANNUAL CAPACITY, 400.

HENDRICKS BROS.,
BELLEVILLE COPPER ROLLING MILLS,
49 CLIFF STREET, NEW YORK
MANUFACTURERS OF
COPPER BRAZIERS, BOLT, SHEATHING. **COPPER** LOCOMOTIVE FURNACE. COPPER
COPPER WIRE AND RIVETS.
IMPORTERS AND DEALERS IN
INGOT COPPER, BLOCK TIN, SPELTER, LEAD
ANTIMONY, BABBITT METAL, SOLDER, ETC.
COPPER

ROGERS LOCOMOTIVE & MACHINE WORKS
PATERSON, N. J.; NEW YORK OFFICE, 44 EXCHANGE PLACE.



MANUFACTURERS OF
Locomotive Engines and Tenders and other Railroad Machinery
J. S. ROGERS, President. JOHN HAVRON, Secretary. } PATERSON, N. J.
R. S. HUGHES, Treas. 44 Exchange Place, New York
REUBEN WELLS, Superintendent.

COMPOUND LOCOMOTIVES
PATENT AUTOMATIC INTERCEPTING AND STARTING VALVE.
The best results of COMPOUNDING LOCOMOTIVES have been obtained by the use of the
Worsdell, VonBorries & Lapage's System.
LICENSE to build Locomotives granted under the Patents of
WORSDELL, VON BORRIES AND LAPAGE.
We are prepared to furnish Railroad Officers and Locomotive Builders with full particulars showing the Economy of the COMPOUND, together with working drawings, etc.
ADDRESS CORRESPONDENCE TO
G. L. FOWLER, 53 Broadway, NEW YORK.
TAITE & CARLTON, 63 Queen Victoria St., London, Eng.

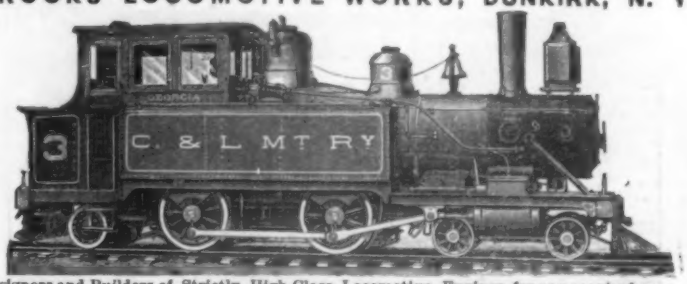
COOKE LOCOMOTIVE & MACHINE CO. Paterson N. J.
(Formerly Danforth Locomotive & Machine Co.)

JOHN S. COOKE, President & Gen. Man.
FRED. W. COOKE, Vice-President.
WM. BERDAN, Sec'y & Treas. } PATERSON, N. J.
New York Office, 45 BROADWAY.
H. A. ALLEN, Agent.

PITTSBURGH LOCOMOTIVE & CAR WORKS
PITTSBURGH, PA.,

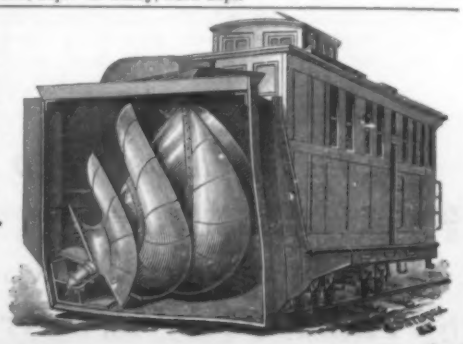
MANUFACTURERS OF
LOCOMOTIVE ENGINES FOR BROAD OR NARROW GAUGE ROADS.
From standard designs, or according to specifications, to suit purchasers.
Tanks, Locomotive or Stationary Boilers Furnished at Short Notice
D. A. STEWART, Pres't. D. A. WIGHTMAN, Sup't. WILSON MILLER, Sec. and Treas.

BROOKS LOCOMOTIVE WORKS, DUNKIRK, N. Y.



Designers and Builders of Strictly High-Class Locomotive Engines for any required serv
M. L. Hinman, Pres. & Treas. R. J. Gross, V-Pres. T. M. Hoeusenbourg, Sec.
D. Russell, Supt. H. Tandy, Asst. Supt.

JULL CENTRIFUGAL SNOW EXCAVATOR.
MANUFACTURED BY THE
JULL M'F'G.CO.
189 MONTAGUE ST.
BROOKLYN, N.Y.



THE KING BRIDGE COMPANY.

Iron and Steel Bridges, Girders, Turntables, Buildings, Eye Bars, Elevated Railroads and Structural Work of all kinds.

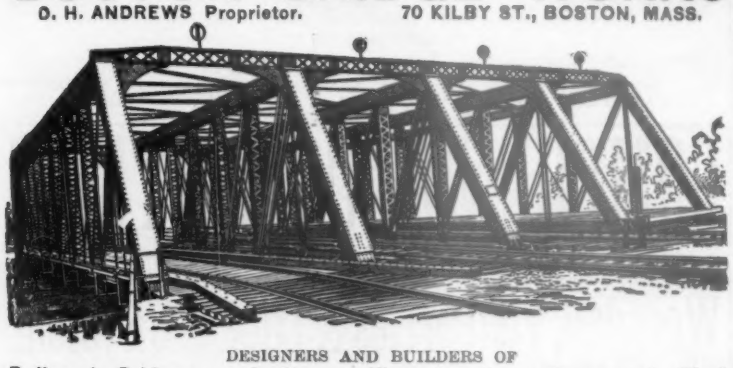
OFFICE AND WORKS: CLEVELAND, OHIO.

CHICAGO OFFICE: 1105-1107 ROOKERY BUILDING.
NEW YORK OFFICE: WELLES BUILDING, 18 BROADWAY

CAPACITY, 20,000 TONS PER ANNUM.

BOSTON BRIDGE WORKS

D. H. ANDREWS Proprietor. 70 KILBY ST., BOSTON, MASS.



DESIGNERS AND BUILDERS OF

Railroad Bridges and Heavy Wrought Iron Structural Work

OF EVERY DESCRIPTION.

SUPERIOR WROUGHT IRON TURNTABLES A SPECIALTY.

Works on Grand Junction Railroad.

MO. VALLEY BRIDGE & IRON WORKS

LEAVENWORTH, KAN.

A. J. TULLOCK
Proprietor.

MANUFACTURER AND BUILDER OF

Wrought Iron, Steel, Howe Truss and Combination Bridges, Turn Tables, Draw Spans, Roof Trusses, Piers Substructures Foundations, Etc., Etc.

CHAS. M. JARVIS, Prest. & Chf. Engr. BURR K. FIELD, Vice-Prest.
FRANK L. WILCOX, Treas. GEO. H. SAGE, Secy.

THE

BERLIN IRON BRIDGE CO.,

EAST BERLIN, CONN.

The above illustration, taken direct from a photograph, shows a Cantilever Bridge designed and built by us for the Keeseville & Au Sable Chasm R. R., at Au Sable Chasm, N. Y.

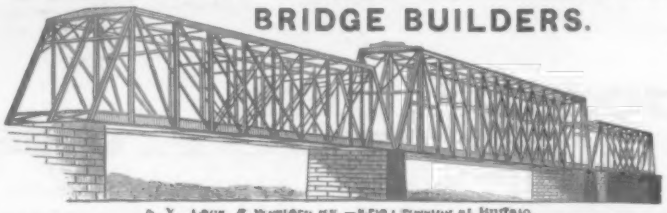
SEND FOR ILLUSTRATED CATALOGUE.

OFFICE AND WORKS:

No. 1 RAILROAD AVE., EAST BERLIN, CONN.

WORKS AT PATERSON, N. J. **Passaic Rolling Mill Co.** NEW YORK OFFICE, Aldrich Court, 45 Broadway

BRIDGE BUILDERS.



N. Y., Lake & Western Ry.—Erie Crossing at Buffalo.

Wrought Iron Railroad & Highway Bridges, Turn Tables & Roofs.
All made from the best material of our own manufacture. Manufacturers of all kinds of Iron and Iron Work for Bridges and Buildings. Plans and Estimates furnished.
WATTS COOKE, Pres. W. O. FAYERWEATHER, Treas. G. H. BLAKELEY, Chf. Engr

CHAS. KELLOGG, Prest. ROBT. GRIMES, Vice-Prest. WALTER HAWKHURST, Treas. W. S. McCORD Secy.

ELMIRA BRIDGE COMPANY,

(LIMITED)

ENGINEERS AND MANUFACTURERS.

Steel & Iron Bridges, Roofs & Turntables

ELMIRA, N. Y.

OFFICE AND WORKS: Elmira, N. Y. NEW YORK OFFICE: 18 Broadway.

S. W. FRESCOLN,

ENGINEER AND CONTRACTOR,

WORLD BUILDING, NEW YORK CITY,

—DESIGNS AND BUILDS—

Bridges, Viaducts, Iron and Steel Structures, Railroads, Pneumatic Foundations, Harbor Works.

NEW JERSEY STEEL & IRON CO

TRENTON, N. J.,

BUILDERS OF

BRIDGES, ROOFS, Etc.

COOPER, HEWITT & CO.,

17 Burling Slip, New York.

Plans and Estimates Furnished for Draws, Fixed Spans, Etc.

ROCHESTER BRIDGE & IRON WORKS,

J. F. ALDEN,

Successors to Alden & Lassig and Leighton Bridge & Iron Works,

ROCHESTER, N. Y.

—DESIGNERS AND BUILDERS.—

WROUGHT IRON AND STEEL WORK FOR BRIDGES AND BUILDINGS.

LOUISVILLE BRIDGE & IRON COMPANY

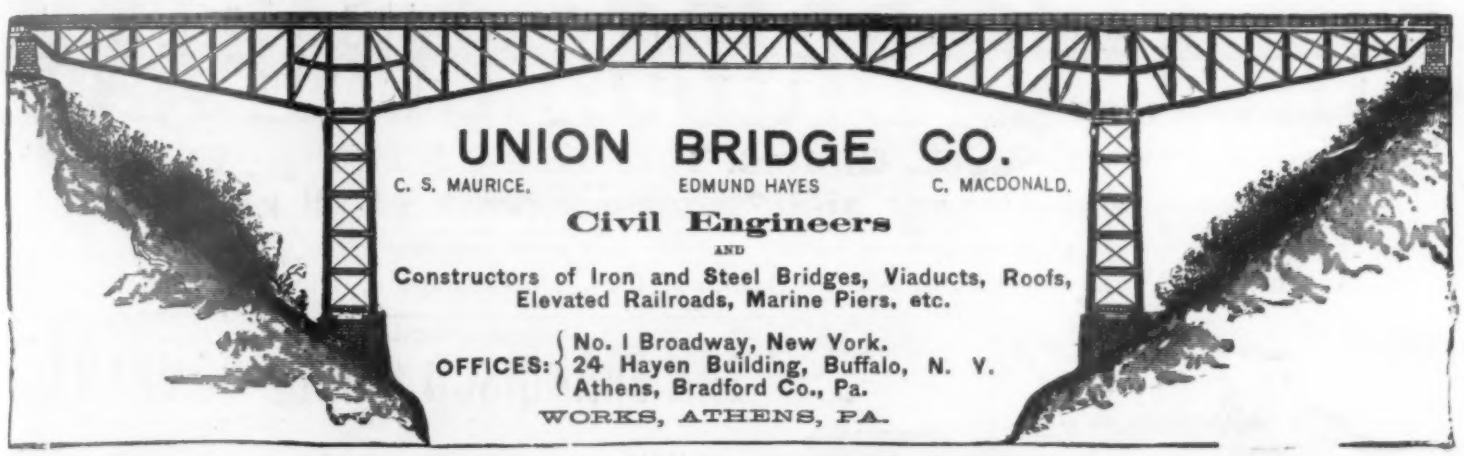
OFFICE AND WORKS: CORNER OLDHAM AND 11TH STS., LOUISVILLE.

BUILDERS OF

TRIANGULAR, WHIPPLE AND FINK TRUSSES.

and other forms of Iron and Combination Bridges. Also Manufacturers of Iron Roofs, Turn Tables, Frogs, Switches, etc.

J. M. JOHNSON, Pres. & Engr. E. BENJAMIN, Vice-Pres. F. H. VAUGHAN, Sec. & Treas



UNION BRIDGE CO.

C. S. MAURICE. EDMUND HAYES C. MACDONALD.

Civil Engineers

AND

Constructors of Iron and Steel Bridges, Viaducts, Roofs, Elevated Railroads, Marine Piers, etc.

OFFICES: No. 1 Broadway, New York.
24 Hayen Building, Buffalo, N. Y.
Athens, Bradford Co., Pa.

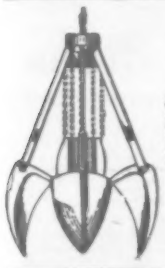
WORKS, ATHENS, PA.

J. F. ANDERSON. C. C. BARR

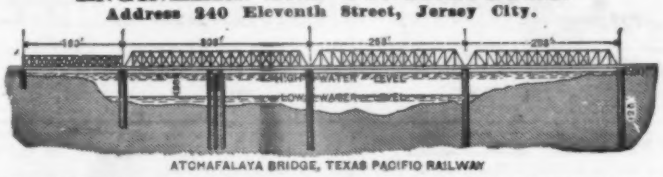
ANDERSON & BARR

ENGINEERS AND CONTRACTORS.

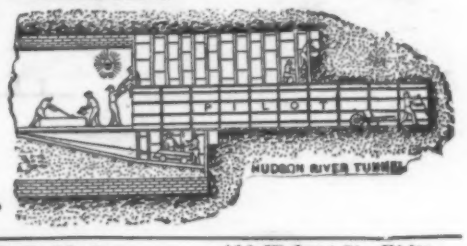
Address 240 Eleventh Street, Jersey City.



Automatic Dredge for Sinking Cylinders.



ATCHAFALAYA BRIDGE, TEXAS PACIFIC RAILWAY



HUDSON RIVER TUNNEL

Pneumatic Work, Deep Foundations and Tunneling in Soft Materials Specialties

Control the Patents for the Automatic Dredge and the Anderson System of Tunneling.

THE PHŒNIX BRIDGE CO.,

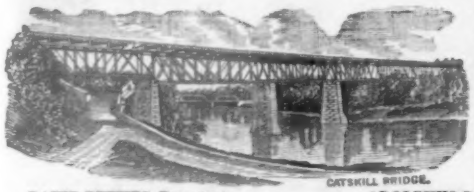
Successors to Clarke, Reeves & Co.

PHŒNIXVILLE BRIDGE WORKS

Offices: 410 Walnut St., Phila.
49 William St., New York
Phœnixville, Pa.

ENGINEERS AND BUILDERS OF

Bridges, Viaducts, Roofs, Turn-Tables, Etc.



CATSKILL BRIDGE.

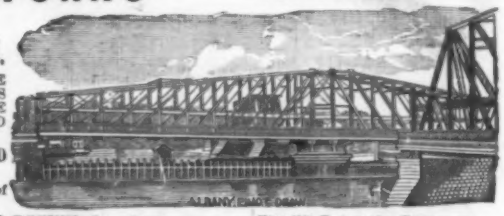
SPECIALTIES:

Accurate Workmanship; the use of Double-Refined Iron; no welds; Phœnix Upper-chords and Posts; the best form of Strut known.

ALL WORK DONE ON THE PREMISES — FROM ORE TO FINISHED BRIDGES.

ILLUSTRATED ALBUM

Mailed on receipt of $3.00.



ALBANY CAST ARCH

DAVID REEVES, President. ADOLPHUS BONZANO, Vice-Pres. and Chief Eng'r. WILLIAM H. REEVES, Gen. Supt. FRANK T. DAVIS, Treasurer.

A. & P. ROBERTS & COMPANY.

PENCOYD IRON WORKS

MANUFACTURERS OF

Wrought Iron and Open Hearth Steel,

OFFICE: 261 S. 4th Street, PHILADELPHIA, Pa.

PENCOYD BRIDGE & CONSTRUCTION COMPANY

DESIGNERS AND MANUFACTURERS OF

BRIDGES. VIADUCTS, TURN TABLES, Etc.

WORKS, PENCOYD, PA.

THE POTTSVILLE BRIDGE COMPANY.

DESIGNERS AND BUILDERS OF

BRIDGES, VIADUCTS, ROOFS, ETC.

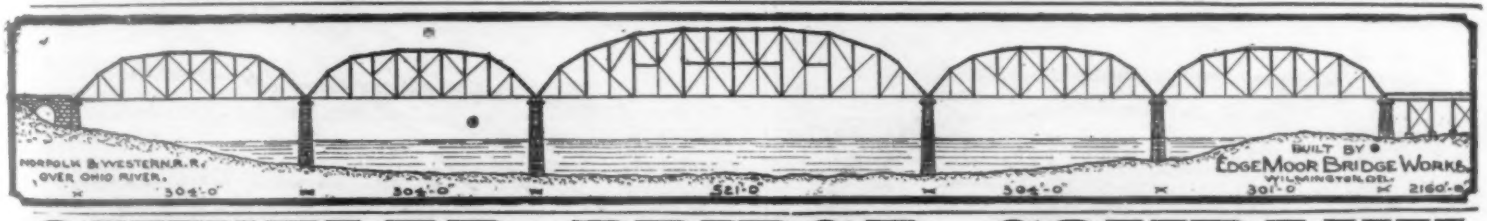
Office: No. 226 South Fourth Street, Philadelphia, Pa. Works: Pottsville, Pa

---

KEYSTONE BRIDGE CO.

GENERAL OFFICE AND WORKS, PITTSBURGH, PA.

WESTERN OFFICE, 205 LASALLE ST., CHICAGO, ILL. EASTERN OFFICE, 46 WALL ST., NEW YORK.



SHIFFLER BRIDGE COMPANY,

DESIGNERS AND MANUFACTURERS OF

Railway Bridges, Viaducts, Train Sheds, Girders, Roof Trusses, Iron Buildings, Etc.

Office and Works: 48th STREET and A. V. R. R., PITTSBURGH, PA.

THE PITTSBURGH BRIDGE CO.

WESTERN OFFICE: 1105 OWINGS BUILDING, CHICAGO.

W. W. CURTIS, Western Representative.

THE YOUNGSTOWN BRIDGE CO.

MANUFACTURERS OF

IRON & STEEL

BRIDGES

IRON STRUCTURAL WORK IRON ROOF AND TURN TABLES

YOUNGSTOWN, O.

James Neilson, Pres. W. J. Coulter, Ch. Eng.
B. F. Bochron, Vice Pres. B. F. Boyd, Sec. & Treas.

CHICAGO BRIDGE & IRON CO

443 Rookery Building, CHICAGO, ILL.

Works: 105 & 106 Sts., Rock Island & Panhandle Railroad.

Successors to Kansas City Bridge & Iron Co., Kansas City, Mo.; Horace E. Horton, Rochester, Minn.

MANUFACTURERS OF

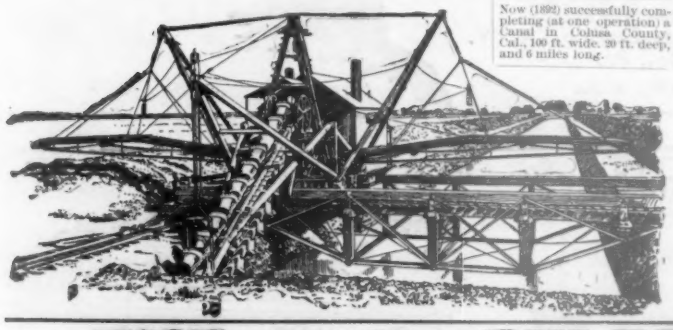
METALS for STRUCTURES.

CONTRACTORS AND BUILDERS

Steel, Iron and Combination Bridges. Masonry and Metal Substructures.

San Francisco Bridge Co.'s Suction Dredge Working for U. S. Gov., Oakland, Cal., Discharging through 5,700 ft. Pipe.
WILL DIG AND PUT ASHORE ANY MATERIAL, ROCK EXCEPTED.

Machines at Work at Boston, Mass., Oakland, Cal., and Honolulu, Hawaiian Islands.



Patent Excavator.
Now (1892) successfully completing (at one operation) a Canal in Colusa County, Cal., 100 ft. wide, 20 ft. deep, and 6 miles long.

ESTABLISHED 1877. INCORPORATED 1883. CAPITAL (PAID UP) $250,000.

SAN FRANCISCO BRIDGE COMPANY.

J. McMULLEN, Pres. J. M. TAYLOR, Sec. and Treas. GEO. W. CATT, C. E., Vice-Pres. H. S. WOODS, Engineer. H. KRUSI, Chief Engineer. J. B. C. LOCKWOOD, Eng'r.

OFFICES: { World Building, New York, N. Y. San Francisco, Cal., Seattle, Wash.

CIVIL ENGINEERS AND CONTRACTORS.

SPECIALTIES: Machinery for Economical Excavation of Canals; for Suction Dredging; for Filling and Reclamation of Low Lands.

CORRESPONDENCE SOLICITED.

THE PHILADELPHIA BRIDGE WORKS.

JOS. H. COFRODE. OHIO RIVER BRIDGE AT BEAVER, PA.—CHANNEL SPAN 446 FEET. FRANCIS H. SAYLOR.

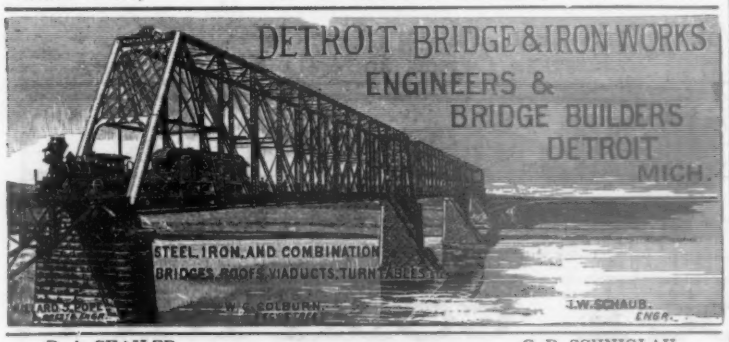
COFRODE & SAYLOR, Civil Engineers and Bridge Builders, design and construct Iron Wooden and Combination Bridges, Roofs Locomotive Turn-Tables etc. Office: No. 257 South Fourth Street, Philadelphia.

CREOSOTED MATERIAL.

THE CREOSOTE LUMBER & CONSTRUCTION CO.,
OF FERNANDINA, FLA.

Furnishes CREOSOTED MATERIAL of all kinds by the cargo and carload. Manufacturers of WOOD CREOSOTE OIL, the only oil used at their works in protecting timber against decay and the ravages of the seaworms. Shipping facilities unsurpassed by rail and water. Write for circular and prices. B. T. BURCHARDI, Chief Engineer and Superintendent.

SOOYSMITH & COMPANY
(INCORPORATED),
CONTRACTING ENGINEERS,
Design and build in any part of the country
BRIDGE PIERS, PNEUMATIC CAISSON FOUNDATIONS, TUNNELS.
MARINE PIERS, DOCKS, LIGHTHOUSES,
AND ALL KINDS OF ENGINEERING CONSTRUCTIONS.
THE FREEZING METHOD
Now in use by us, and for which we control the American Patents, makes the construction subaqueous tunnels, deep foundations, shafts, etc., practicable in soft or water-bearing ground and to depths hitherto unattainable.
Main Office, - - No. 2 NASSAU STREET, NEW YORK.



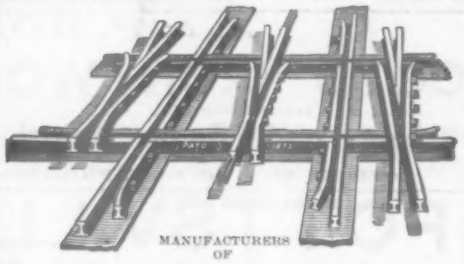
R. A. SHAILER. C. R. SCHNIGLAU.
SHAILER & SCHNIGLAU,
Successors to W. G. COOLIDGE & CO.,
Engineers and Contractors,
DESIGNERS AND BUILDERS OF
BRIDGES, BUILDINGS AND SUBSTRUCTURES.
609 610 & 611 Phenix Building, 138 Jackson St., Chicago, Ill.

THE WALLIS IRON WORKS.
Iron Buildings, Bridges, Turntables, Roofs and Riveted Girders
SOLE MANUFACTURERS OF THE PERKIN'S PATENT SHUTTERS.
Main office and works: 7, 9, 11, 13, 15 Morris and 7 and 9 Essex Sts.
Telephone, 38. JERSEY CITY, N. J.
NEW YORK OFFICE, 95 LIBERTY STREET.

ALEX. McCLURE,
MANUFACTURER OF
LONG PINE BRIDGE TIMBER.
PITTSBURGH, PA.
Capacity, 150,000 Feet Per Day.
Run all the Year. Can Fill Orders in Winter on Short Notice.

ELLIOT FROG & SWITCH CO

RIGID FROGS. LAP SWITCHES. Rails of any Weight or Section Desired Carried in Stock.

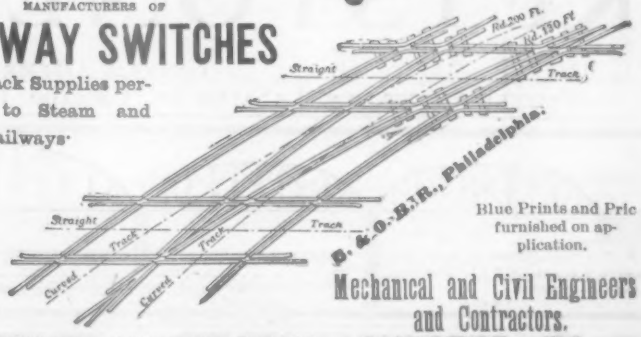


MANUFACTURERS OF
Wrought Iron Head Chairs, Rail Braces, Bridle Rods and every description of Railroad Iron Work. Catalogue and other information furnished on application. EAST ST. LOUIS, ILL.

SPRING RAIL FROGS. SPLIT SWITCHES. AUTOMATIC SWITCH STANDS.

SAMUEL LEES, President. EDWARD H. JOHNSTON, General Manager. AMOS GARTSIDE, Treasurer.

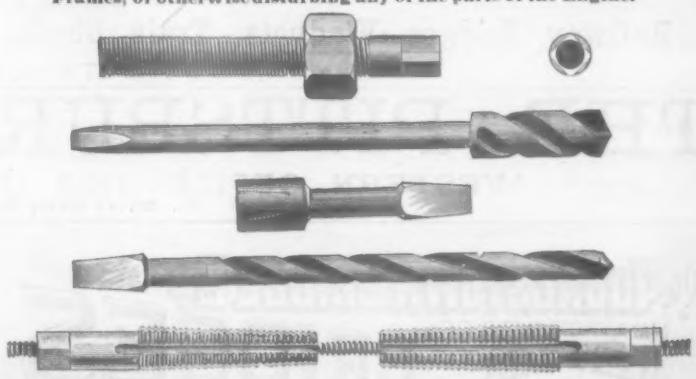
Johnston Railroad Frog & Switch Co.
MANUFACTURERS OF
RAILWAY SWITCHES
All Track Supplies pertaining to Steam and Street Railways.



Blue Prints and Prices furnished on application.

Mechanical and Civil Engineers and Contractors.
OFFICE AND WORKS, CHESTER, PA.

Patented Devices for Drilling Out or Removing old or Broken Staybolts from the Fireboxes of Locomotives without removing the Drivers, Frames, or otherwise disturbing any of the parts of the Engine.



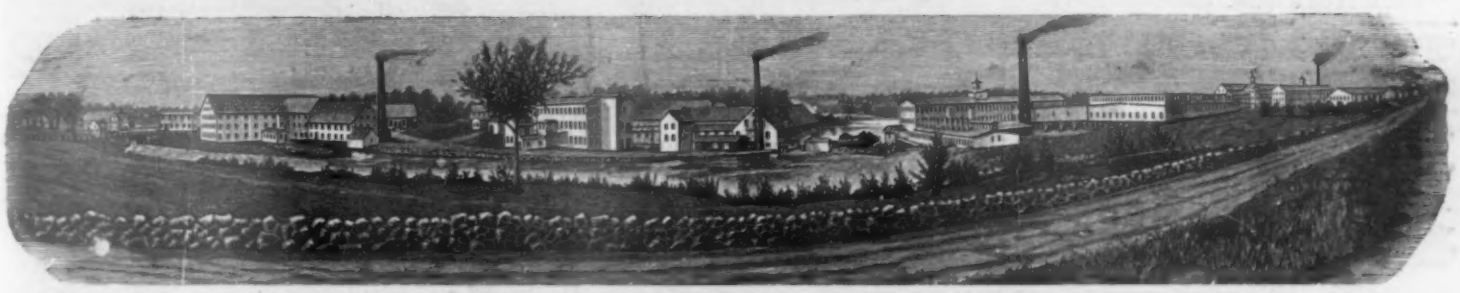
Radial Taps, especially adapted for long distances and to suit any required size. Address J. T. CONNELLY, Milton, Pa.

AUTOMATIC SWITCH STANDS.

SANFORD MILLS,

MANUFACTURERS OF

CAR PLUSHES.



WE CLAIM FOR OUR CAR PLUSHES:

1. SUPERIORITY IN QUALITY AND FINISH TO ANY FOREIGN GOODS.
2. MORE DURABILITY IN COLORS THAN FOREIGN, AS DEMONSTRATED BY ACTUAL TESTS.
3. THAT THE ABOVE ARE FACTS IS PROVED BY THE CONTINUED SUPPORT OF THE BEST CAR-BUILDERS IN THE COUNTRY.

WE CAN FURNISH ANY COLOR OR SHADE DESIRED.

L. C. CHASE & CO., Selling Agents, 129 Washington St., Boston, Mass.

338 BROADWAY, NEW YORK. 260 FIFTH AVENUE, CHICAGO.

BOOKS FOR RAILROAD MEN

Published by the RAILROAD GAZETTE, 73 Broadway, New York.

THE LOCOMOTIVE.

1891 Edition.—*Catechism of the Locomotive*, by Matthias N. Forney.—There is no popular treatise on the locomotive in the English language which gives so clear, simple and complete a description of the construction and working of the locomotive engine. 725 pages, 488 engravings. Price, $3.50.

Locomotive Engine Running and Management, by Angus Sinclair.—Showing the performance of locomotives in running different kinds of trains with economy and dispatch; also directions for the care and repair of locomotives and their connections. Price, $2.00.

Engineer's and Fireman's Time, Expense and Memorandum Account Book. With rubber-tipped pencil. Conveniently arranged pages for a daily record of time, miles run, rate and amount earned; also for individual expense account each month and general memoranda. A certain method of checking with the time-keeper. Lasts one year. Price, 50 cents.

CARS.

Car-Builders' Dictionary. Revised edition containing 2,188 engravings, with descriptions of American Cars of every description, and of the different kinds of Trucks, Wheels, Brakes, Couplings, Seats, Lamps, Heaters and all Car Furnishings in general use, in the minutest detail. The most complete and valuable book on the subject. Price, $3.00.

Car-Heating Patents. An abridgment of patents relating to continuous car-heating. By G. P. Whittlesey. Price, $1.00.

Depreciated Values Table, showing the depreciated values of freight cars for all the prices given in the Code of Rules, for EACH MONTH up to fourteen years and nine months. Price, 50 cents.

PERMANENT WAY.

The Roadmaster's Assistant, by Wm. S. Huntington. Revised by Chas. Latimer. A manual of reference for all having to do with the permanent way of American railroads. This book will help the section man and roadmaster to do better work. Price, $1.50.

...rack, by W. B. Parsons, Jr. A comp...ete manual of maintenance of way according to the latest and best practice on American railroads. 123 engravings of tools and appliances in the road department. This is the latest and best book on the subject. Price, $2.00.

Scales for Turnouts, by E. A. Giessler. Gives graphically the frog numbers, length of lead and degree of curvature for turnouts from 3° to 42° 30'. Stiff card-board, pocket size. More convenient and certain than tables. Price, with full directions for use, 25 cents.

ENGINEERING.

Economic Theory of Railway Location, by A. M. Wellington. An analysis of the conditions controlling the laying out of railroads to effect the most judicious expenditure of capital. 990 pages; 200 tables; 313 engravings. Price, $5.00.

Standard Specifications for Railroad Structures. 1, Brick Passenger Stations; 2, Brick Freight Houses; 3, Brick Engine Houses; 4, Frame Passenger Stations; 5, Frame Freight Houses. Price, 50 cents each.

Iron Railroad Bridges and Viaducts.—General Specifications for. By Theodore Cooper. Price, 25 cents.

Iron Highway Bridges and Viaducts.—General Specifications for. By Theodore Cooper. Price, 25 cents.

RAILROAD ACCOUNTS.

BY MARSHALL M. KIRKMAN.

Passenger Traffic and Accounts. Regulations governing the handling of passengers at stations and upon trains, and ticket accounts and forms. Appendix gives 27 blank forms used in tickets and ticket accounting. Price, $2.00.

Freight Accounts. Handling freight and rules governing agents and their accounts. Appendix contains 51 blank forms. Price, $2.00.

Handling of Railway Supplies, their purchase, inspection, care, storage, disbursement and use. A manual for all officers having charge of supplies or supervision over those who use them. Price, $2.50.

How to Collect Revenue Without Loss. Discussing the general principles and methods which must be observed. Price, $2.50.

Train and Station Service. Describing how trains are organized and operated. Price, $2.50.

Baggage, Parcel and Mail Traffic. Its practical workings and the principles that underlie its operation. Price, $2.50.

Track Accounts. How they should be kept. Pamphlet. $1.00

Maintenance of Railways. 1st, Administrative; 2d, Cost of preserving the property. Pamphlet, $1.00.

Requisitions for Railway Material. (Rules and Regulations.) Pamphlet, $1.00.

Method of Paying Large Bodies of Men. A paymaster's manual. Pamphlet, $1.00.

MISCELLANEOUS.

Block Signaling. Clear descriptions of the simple block system; single-track blocking; Sykes system; automatic clock-work and electro-pneumatic track circuit systems. Also elaborately illustrated descriptions of the different methods in use on the principal American railroads. Price, $2.00.

Train Wire, by J. A. Anderson, of the Pennsylvania Railroad. The most complete and practical hand book of train telegraphing published. Price, $1.25.

The Elements of Railroading, by Chas. Paine. A series of essays on the different departments of railroad operation. The most interesting book on railroading ever published and it is written by one of the most accomplished railroad officers now living. His long experience as Chief Engineer, General Superintendent and General Manager justifies him in speaking with authority, and all railroad men can read these essays with pleasure and profit. Price, $1.00.

Time-Table Constructor and Speed Calculator, by William Fleming. Gives the time for running any distance, at any speed, and the speed of any train, at sight. Price, $1.00.

Local Passenger Traffic, by F. J. Lee. Tariff, conditions and regulations, with rules of construction of proportionate mileage tables for constant and occasional travel. Pamphlet, 25 cents.

State Railroad Commissions. Nature and operation and the laws of all States that have commissions. Pamphlet, 50 cents.

The Argument for State Railroad Ownership. Pamphlet, 25 cents.

The Verragus Viaduct (Pontzen). Pamphlet, 40 cents.

Standard and Narrow Gauge (Von Weber). Pamphlet, 25 cents.

American Railway Master Mechanics' Association Reports. Each, $1.75.

Master Car-Builders' Association Reports. Each, $1.50

Standard Drawings, on Card Board: Car Axle; Journal bearing Journal-box; Pedestal. Price, 20 cents each.

HENRY D. LAUGHLIN, Prest.
E. B. LEIGH, V.-P. and Gen'l Mgr.
A. J. FARLEY, Secy.
L. C. BURGESS, Supt.
GENERAL OFFICE AND WORKS:
40th and Hopkins St. Chicago.
CITY OFFICE:
514 Phenix Building, Chicago.
NEW YORK OFFICE:
Room 118, 29 Broadway.
FRED'K G. ELY, Eastern Agent.

NATIONAL HOLLOW BRAKE BEAM COMPANY.

A Perfectly Constructed Metal Brake Beam
The Cheapest, Lightest and most Durable.
Now Standard on a large number of roads throughout the country.
Correspondence Solicited.

The Best Rail Fastening in the World for the Money!
THE GOLDIE PERFECT RAILROAD SPIKE IN SOFT STEEL
DILWORTH, PORTER & CO., Ltd., Pittsburgh, Pa.,
OR {C. H. MECUM, 213 Phenix Bldg., Chicago. / M. M. BUCK & CO., St. Louis.} AGENTS {H. C. McNAIR, St. Paul. / C. M. NOYES, Milwaukee

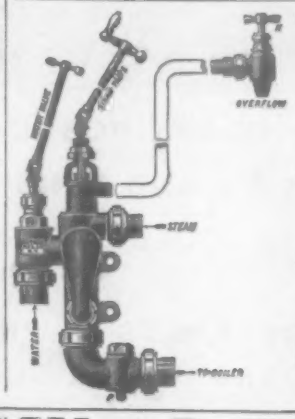
MAGNETO ALARM SIGNAL, FOR HIGHWAY CROSSINGS
EFFICIENTLY AND ACCEPTABLY PROTECTS THE PUBLIC FROM ACCIDENT
By an unmistakable warning of the approach of every train, of such vigor and emphasis as to arouse the attention of the most unwary. Gives no false alarms. Obviates employment of watchmen at the majority of crossings, at a great saving in expenditure
MAKES ITS OWN ELECTRICITY
Only as required, by passage of train over track levers of substantial Magneto Generators in strong iron cases alongside the tracks at required distance from crossing. No cup batteries are used. No freezing in winter. No failure of power. Requires only lubrication, and a little attention to working parts, at intervals.

READY AT ALL HOURS.
Action incomparably better, quicker and louder than any other electric signal. No other signal has the advantage of Magneto Generators with only alternate currents, having no commutators, and constantly in circuit, with no springs or weights in striking apparatus. Furnished on approval to roads wanting to test.
Manufactured by PENNSYLVANIA STEEL CO., Steelton, Pa.
STEEL RAILS of all patterns, Steel Forgings, Billets and Bars, Steel Rail FROGS, Crossings, Split Switches, Safety Switches, Switch Stands, Switch Fixtures, Etc.

THE MOST DESIRABLE
STYLE OF

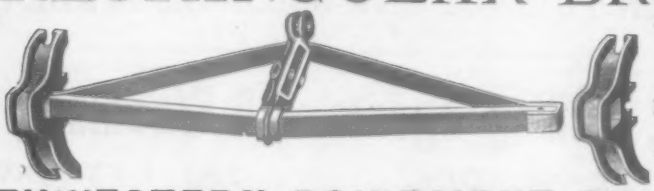
Velocipede Hand Car.

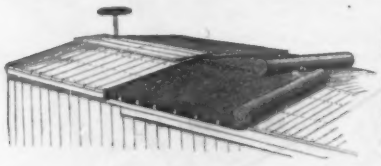
Manufactured in Four Different Patterns.
CORRESPONDENCE SOLICITED.
SHEFFIELD VELOCIPEDE CAR COMPANY. Three Rivers, Mich.



THE NEW "NATHAN"
(See Illustration),
—AND—
MONITOR INJECTORS
FOR LOCOMOTIVES.
"Nathan" Sight-Feed Lubricators
For Locomotive Cylinders and Air Brakes.
STEAM FIRE EXTINGUISHERS
For Switching and Yard Engines.
Boiler Washers, Rod and Guide Oil Cups, Etc.
NATHAN MFG. CO.,
92 & 94 LIBERTY STREET, NEW YORK.
SEND FOR DESCRIPTIVE CATALOGUE.

"Machined" Car Wheels.
600,000 Made under our
SYSTEM OF COMPARATIVE TESTS
Without one case of breakage in service.
We contract to regrind our wheels at points of removal, saving freight and increasing total life of wheels from 100 to 300 per cent.
NEW YORK CAR WHEEL WORKS, BUFFALO, N.Y.
NEW YORK OFFICE: COR. BANK AND WEST STS.

KEWANEE RECTANGULAR BRAKE BEAM.
WEIGHT OF PASSENGER BEAM
75 LBS.
WEIGHT OF FREIGHT BEAM,
60 LBS.
Meets All M. C. B. Requirements.

Heads Well Fitted On, Riveted, and Cannot Work Loose or Get Out of Alignment.
MAXIMUM VERTICAL STIFFNESS.
MINIMUM COST OF MAINTENANCE
ANY STYLE OF HEADS FURNISHED
NO NUTS OR BOLTS.
EDWARD I. FROST, Vice-Prest.
CHARLES L. SULLIVAN, Gen. Supt.
NORTHWESTERN EQUIPMENT CO., Monadnock Building, CHICAGO, ILL.

THE HUTCHINS FREIGHT CAR ROOF.

This roof is in extensive use for over twelve years, durable and attractive in appearance and costs less than a grooved board roof.
In repairing old cars, the under course of boards can always be utilized—a great saving—making it the cheapest and best roof for repair work in the market. This roof is standard on a large number of leading railroads in the country. *Send for Pamphlet and Blue Print.*
C. B. HUTCHINS & SONS, DETROIT, MICH.
Chicago Office: 904 "The Rookery."

LOUISVILLE STEAM FORGE CO

CAR AND LOCOMOTIVE AXLES.
MERCHANT BAR AND FORGED IRON.
Draw-bars, Link and Pins, Follower Plates, RAILROAD FORGINGS Arch Bars, Splice Bars, Track Bolts, Bridge Rods with Plain or Upset Ends, All Sizes.
OFFICE AND WORKS:
SHIPP AVENUE, COR. SIXTH. LOUISVILLE, KY.

SHARON STEEL CASTING CO.
SHARON, PA.
OPEN HEARTH STEEL CASTINGS
Equal to Forgings.
RAILROAD WORK A SPECIALTY. SEND FOR PRICES.

DELAWARE, LACKAWANNA & WESTERN R. R. CO.,
MORRIS & ESSEX SHOPS,
DOVER, N. J., Dec. 28, 1891.
KNITTED MATTRESS CO., Canton Junction, Mass.:
SIRS: We have been using your padding for coach seats and backs during the past five years. Have it now in about 45 to 50 coaches.
Consider it equally as good, and in some respects better than curled hair, just as durable, gives us a better shape and a more comfortable seat than curled hair, with a saving of about $30 to each car. Yours, etc
(Signed) J. W. BAKER, M. C. B.

STEEL CASTINGS
True to Pattern, sound, solid, free from blow-holes, and of great strength.
Stronger and more durable than iron forgings in any position or for any service whatever.
20,000 Knuckles for M. C. B. Standard Car Couplers.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.
Cross Heads, Rockers, Piston Heads, etc., for Locomotives. STEEL CASTINGS of every description.
Send for Circulars and Prices to
CHESTER STEEL CASTINGS CO.
Works, Chester, Pa Office, 407 Library St., Philadelphia, Pa

STEEL CASTINGS.
PRATT & LETCHWORTH
PROPRIETORS,
BUFFALO STEEL FOUNDRY
Buffalo, N. Y.

THE MT. VERNON BRIDGE CO., MT. VERNON, O.
IRON and STEEL BRIDGES, BUILDINGS, Etc.

DO YOU BORE CYLINDERS?
THE HORIZONTAL BORING MACHINE
IS A SPECIAL TOOL FOR THIS PURPOSE.
SEND FOR PARTICULARS TO
NEWARK MACHINE TOOL WORKS,
NEWARK, N. J.

Wilson's Rolling Steel Shutters
FOR FREIGHT SHEDS AND ENGINE HOUSES.

Rolling Steel Shutters.
74 West 23d St., - - NEW YORK.

Librarian of Congress 31Dec92